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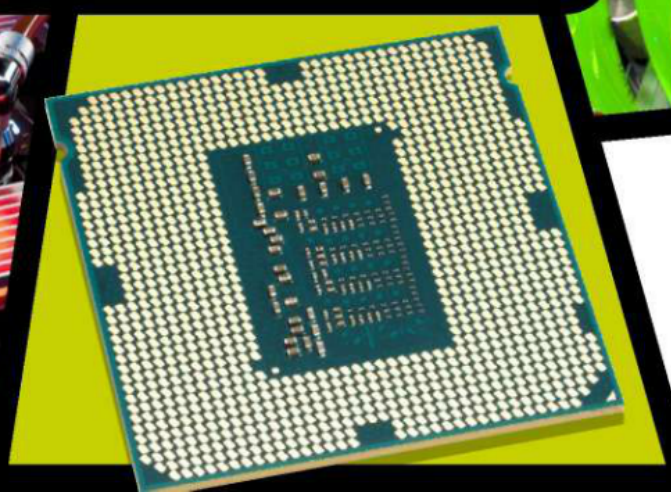

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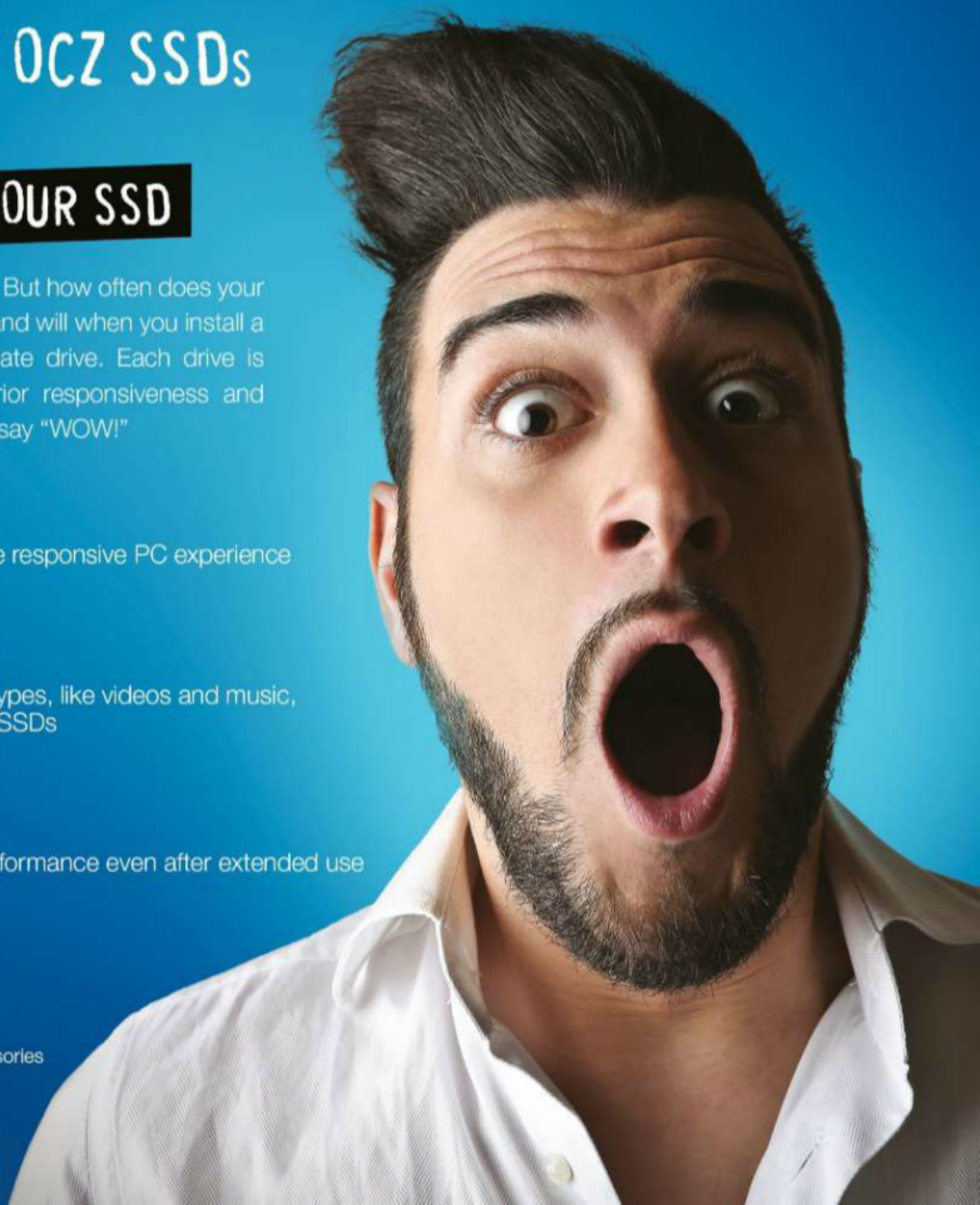

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Gordon Mah Ung

WHY DREAM?

AFTER 18 YEARS OF DREAM MACHINES, we're pretty used to the inevitable "Why?"

Why build a PC that costs $30,000? Why build a machine with eight GPUs? Why 96GB of RAM? Why 28 terabytes of storage? Why two different types of CPUs, and why a "case" that won't fit in most people's homes?

I won't infuriate nonbelievers by saying "Because it's there," because that would just confuse them. Instead, let me explain that the Dream Machine isn't designed to be practical. It's certainly not made to be a budget box and sometimes, frankly, it's not even rational.

That's because a practical, rational budget box isn't inspirational. Yes, practical, rational PCs have their place, and you'll find that addressed every month in every issue of *Maximum PC*. But to be truly inspired, to be enthused, to get your blood running, sometimes you have to do something that's simply unimaginable.

And I'll say, this Dream Machine is pretty unimaginable. We solve, after all, the current GPU dilemma of having to choose between Nvidia or AMD, by simply using both. LGA2011 or LGA1150? We have both of those, too.

There's also nothing more inspiring than sitting down in front of the Cross Desk, putting your Diet Coke on the tempered glass, and typing away on the awesome Corsair K95 RGB keyboard (this one's going home with me). On the occasion when you need to take your eyes off the 4K panels and grab a sip, you get to gaze at the hardware humming away underneath. It's enough to remind us all what makes the PC better.

I'd also be remiss if I didn't give due credit to Tom McNamara, who shouldered the brunt of building this year's Dream Machine. It's always a team effort, from editors to artists, and a group effort in selecting the parts, but this year, the work of getting it all to fit, POST, and run was largely on Tom's shoulders. It wasn't a stretch for Tom, though, given that he's been doing our monthly Build It section and coaxing hardware to fit into places they normally wouldn't.

Tom's motivation to suffer through it is the same as mine, though, as well as Jimmy's, Alaina's, Mary's, and Dan's. It's because we want to be inspired by the one passion that ties us all together: a commitment to Pure PC Power. And *that's* why we build the Dream Machine.

Gordon Mah Ung is Maximum PC's Editor-in-Chief, senior hardware expert, and all-around muckraker.

↘ submit your questions to: comments@maximumpc.com

THE NEWS

Ubisoft Denies Nerfing Watch_Dogs PC

An underwhelming port, but not a malicious one

IF YOU'RE THINKING that the final released version of *Watch_Dogs* doesn't look as good as what Ubisoft showed off at E3 2012, you're not alone. A reader from videogame forum Neogaf peeked around one of the game's configuration files and discovered what appeared to be leftover references to the E3 2012 demo. Then a modder figured out that these lines of text referred to graphical enhancements that could be re-enabled, though some glitches sometimes popped up. He claimed that the result looked much better, but the real kicker was that he reported no hit to performance, either.

When Youtube videos started popping up that demonstrated the tweaks in action, with a clearly different lighting model in place, plus beefed up weather effects and water animation, the PC gaming community took out its pitchforks and prepared an effigy for the developer, Ubisoft Montreal. Various crazy conspiracy theories started popping up on the web as to why Ubisoft would nerf the PC version's graphics; one of the most common theories was that Ubisoft was paid by Sony and/or Microsoft to dial down the PC version, to put it on parity with the next-gen consoles. Was it an inferiority complex?

After a period of silence, Ubisoft made a public statement on its website. It admitted that the game did contain programming code could that could still be activated with a few tweaks, stating, "The PC version does indeed contain some old, unused render settings," but added that they were "deactivated for a variety of reasons, including possible impacts on visual fidelity, stability, performance and overall gameplay quality... The mod in question subjectively enhances the game's visual fidelity in certain situations but also can have various negative impacts. Those could range from performance issues, to difficulty in reading the environment in order to appreciate the gameplay, to potentially making the game less enjoyable or even unstable." Given that the game had performance and stability issues to begin with, Ubisoft's statements did not go over well.

We did our own internal testing of the graphical enhancements in question, which you can read more about here: http://bit.ly/MPC_wd. We didn't see any performance dips (that is to say, beyond the normal poor frame rates on the game's Ultra settings), and we generally liked the visual enhancements the tweaks provided. Though we do have to side with Ubisoft to say that the quality of the enhancements is largely subjective.

In general, the tweaks accentuates shadows and make colors look more accurate, which gives the game a much more realistic and gritty feel. We appreciated these aspects of the mod, but it did also make dim areas a little too dark. We could see what Ubisoft was saying when the company implied that it might make reading the environment more difficult.

Could Ubisoft have spent more time optimizing the game for the PC? Without a shadow of a doubt. We're just not convinced the company deserves as much flack as it's getting from the PC gaming community. **—Jimmy Thang**

PNY Responds to SSD Bait-and-Switch Allegations

PNY got swept up into a controversial mix-up after a customer found out that retail units of the company's critically acclaimed 240GB Optima SSD came with LSI Sandforce controllers instead of the SMI controllers review sites were provided with. Users bitterly complained that it was a sleazy bait-and-switch. In response, PNY stated, "The PNY Optima SSD line utilizes multiple qualified controllers to offer the best available solution to our customers," and also added, "We do not and have not specified any one particular brand of controller [for the Optima SSD]." The company followed up with us and reassured that the shipped Optima SSDs with the LSI controllers are of "a very reputable line which meet all advertised performance specifications." **—PL**

How Steam Machines Are Losing Steam

Consumers may be disappointed by the delay of the Steam Controller until 2015, but for those with skin in the game, the news couldn't be worse.

According to numerous Steam Machine hardware vendors, official Steam Machines won't be sanctioned by Valve unless shipped with the official Steam controller. When you do the math, this essentially means the Steam Machines themselves are delayed from their projected Q4 2014 release until some unspecified time in 2015.

One OEM complaint has been of the inconvenience and expense of ordering and sitting on inventory (GPUs, CPUs, etc.), coupled with the fact that these computer components quickly depreciate in value over time. One vendor we spoke with reminded us that unlike Valve, OEMs make no revenue off of Steam game sales. **—JT**

SteamOS to Power Handheld?

The proliferation of smart devices has adversely affected the sale of dedicated handheld gaming devices so much that a new handheld console at this stage, it would seem, would make no sense. Well, a company called Steamboy Machine Team thinks it makes perfect sense.

At E3 2014, the company announced the world's first SteamOS-running handheld games console. Scheduled for release sometime during 2015, the 5-inch device will pack a quad-core chip, 4GB RAM, 32GB internal storage, and a 16:9 touchscreen.

When we asked Valve if they were involved with Steamboy development, the company responded by saying, "We have no idea what this is."**—PC**

Tom Halfhill Fast Forward

NET NEUTRALITY: ANOTHER VIEW

AT THE RISK OF PROVOKING more angry email, I'll wade into the net neutrality debate again. I still oppose strict net neutrality for the same reasons I did when I wrote about this subject in 2006—and events continue to unfold as I said they would.

The Internet is becoming a cable-TV network. Indeed, it's on track to become the primary TV network. At least 60 percent of today's Internet traffic is video, and I expect it will comprise about 95 percent by 2020.

Video requires isochronous (timely) delivery. If network packets carrying an email, text message, Twitter feed, or web page are delayed a few hundred milliseconds, we won't notice. But if packets carrying a video stream are delayed, the playback stutters, ruining the viewer's experience. Thus, it makes sense to give video packets higher priority over other network traffic. Strictly neutral packet routing will upset millions of people and prevent the Internet from becoming the universal entertainment-delivery network that almost everyone seems to want.

Should companies have to pay more money for hogging the Internet's bandwidth and overriding other traffic? I think so. Network capacity isn't infinite and isn't free. All other means of communication charge more money for faster service because faster service costs more money. The Internet is no different in that respect.

Net neutrality opponents worry that carriers will deliberately delay some packets or even block competing websites and services altogether. As I've noted, however, some packets can be slowed without inconvenience. And if carriers engage in anti-competitive behavior, we've got laws against that and can create more if necessary.

Someone must pay for expanding the network. It's only fair to charge the biggest bandwidth hogs. Besides, Americans won't tolerate herky-jerky TV reception for long. We can preserve equal access to the Internet without pretending that all packets are equal.

Tom Halfhill was formerly a senior editor for *Byte* magazine and is now an analyst for *Microprocessor Report*.

Thomas McDonald Game Theory

GAMING AFTER WINDOWS

MICROSOFT KEEPS SWEARING they haven't abandoned PC gaming, but they got through E3 without showing or mentioning anything for the system that built their company. It was All XB1 All The Time because, according to MS gaming honcho Phil Spencer, "E3's a retail show" and "it's a console show." If you say so, Phil.

And after offering glimpses of our Steamy future at CES, Valve was also AWOL at E3, leaving computer gamers feeling like jilted brides.

The delays with Steam machines are apparently due to ongoing work on the controller, but Valve's PC console remains our best hope of shaking up the home entertainment scene. Some hardware makers aren't in the mood for waiting around: Alienware chose to convert their "Steam" machine into a Windows 8 machines instead.

This would have been Microsoft's opportunity to catch a clue, but after all this time we have to admit the obvious: Windows' days as a dominant PC gaming OS are numbered. If MS had seized the opportunity to re-imagine the Xbox One as console/PC hybrid like the Steam machine, it would be Sony that would be curled up in the corner crying right now rather than Microsoft.

PC is ascendant because of several reasons: quality, power, MMOs, and Steam. Microsoft could have dominated the entire sector. Instead, they're barely even making a token effort.

And that's why they will lose the important battle for the future of gaming. Victory goes to the people who can transition PC gaming from desktop to living room with the least amount of effort and cost for the consumer. Microsoft could have used its dominance to achieve this a decade ago, but opted for Xbox and the long, slow downward spiral of PC-lite consoles.

If Valve manages to rally the hardware makers around their OS and pull this off, Microsoft won't just lose the living room. They may even lose the desktop. For want of sound gaming strategy, the entire empire could be lost.

Thomas L. McDonald is Editor-at-Large of Games Magazine.

GTA V for PC Will Be the Definitive Version

After months of rumors, Rockstar finally revealed that *GTA V* would be coming to PC. Set for a fall release, Rockstar assures PC gamers that this won't be a sloppy port (*GTA IV*, we're looking at you). The developer is promising a ton of new features, the biggest of which pertains to the massive graphical overhaul. Expect increased draw distances, finer texture details, denser traffic, and support for higher resolutions. In addition, Rockstar plans on bolstering the multiplayer component of the game, which was a big disappointment when it was released on the consoles last year. The PC version will also include exclusive features, such as smarter AI and a video editor. **—PL**

Oculus Rift Founder: '30fps a Failure'

As all gamers know, if you're pulling 30 frames per second, it's playable, though you don't want to dip much below that. Oculus Rift founder Palmer Luckey has a different number in mind for virtual reality. According to him, VR gaming needs to be in the neighborhood of 60 frames per second—at 30fps, he considers it a failure. His opinion isn't necessarily limited to VR gaming, either.

"Virtual reality is going to need much higher frame rates than consoles," Luckey told LinusTechTips. "Although even for consoles or traditional PC games, I don't think 30 frames per second is smart. It's not a good artistic decision, it's a failure." **—PL**

Tech Tragedies and Triumphs

A monthly snapshot of what's up and down in tech

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Quinn Norton
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FROM THE THAI NET TO YOUR NET

COUPS D'ÉTAT ARE A THING in Thailand. Since 1932, Thailand has weathered 19 coups—12 successfully throwing out the government. But the 2014 coup had a new twist on the old tradition: massive Internet censorship, including a mystifying law against Facebook "liking" any post critical of the junta. (No word on the legal status of hate likes.)

Now the Thai army wants to centralize Internet infrastructure under its control, and making it easier to surveil and censor. They already control mass media—they blacked out regular TV and just played patriotic songs in the worst national karaoke event ever.

Believe it or not, this matters to you. Like Cuba, China, Saudi Arabia, and other governments that want to control their citizens, the Thai army wants to make the Thai Internet behave according to its rules. But that's the problem: there is no Thai Internet, there's just the Internet.

This world has about 200 countries, five major religions, about eight world languages—but only one Internet, which we all share, and it's getting carved up under our noses. When the rulers of Iran or Thailand take their countries away from a neutral net, they're not just taking it from their people, they're taking those people and everything they might someday do, away from you. In the words of Tim Berners-Lee, "This is for everyone." And "this" is each other, a connection of billions.

It turns out that a knowledgeable public, able to communicate, inform, and organize, is a real headache for an army trying to run the government out of town. Across borders, it's capable of even more, which is why Thailand's net connection must play, even in Peoria.

This is the first thing we've done together as a species; let's not screw it up.

Quinn Norton writes about copyright for Wired News and other publications.

Alienware Alpha Console for the Holidays

As we've already mentioned, the official Steam Machines won't launch until sometime next year when Valve is finished tweaking its Steam Controller. Although the news was a drag, it isn't stopping OEM system builders from forging ahead with plans to release console-like PC systems. Case in point: Alienware just announced its Alpha Console, starting at $549.

What the flip is an Alpha Console? Well, it's a cleverly named system that's essentially a Steam Machine running on Windows instead of the Linux-based SteamOS. Alienware has told us that it designed its own 10-foot UI that will allow you to access your music and movies like a console. It will also be integrated with Steam's Big Picture mode and come with an Xbox 360 controller.

In addition to the controller, the $549 configuration includes an unspecified Intel Core i3 Haswell-based processor, 4GB of DDR3/1600 RAM, a custom-built Nvidia GPU based on Maxwell with 2GB of GDDR5 memory, 500GB hard drive, dual-band Wireless-AC 1x1 with Bluetooth 4.0, GbE, two USB 3.0 ports, two USB 2.0 ports, HDMI input (direct HDMI pass-through), HDMI output (uncompressed 8-channel audio and support for 4K content), and Windows 8.1 64-bit.

Valve undoubtedly caught its OEM hardware partners off-guard when it decided to continue tweaking its Steam Controller into next year, which therefore meant delaying official Steam Machine systems. Rather than let all that R&D go to waste, or be put on hold, it appears that Dell has chosen to launch what would have been its Steam Machine, but with a new name and with Windows running the show. **–PL**

Haswell-E Autumn Rumors

Rumor has it that the next-gen Haswell-E processors will hit the shelves, and perhaps your mobo, in late summer or early autumn. A leaked document points to September 14, 2014 as Intel's launch day, which could coincide with an announcement at Intel's upcoming IDF 14 in San Francisco—this year's IDF runs September 9–11.

According to an excerpt from the leaked document posted on a Chinese-language portal, at least three Core i7 chips based on Haswell-E will debut on September 14, along with Intel's upcoming X99 chipset. One thing to keep in mind if you're planning a next generation build is that X99 boards will require DDR4 memory.

The three Core i7 parts mentioned all reportedly have a TDP of 140W and support Hyper-Threading. **—PL**

Computer AI Program Passes Turing Test

It only took about 65 years, but a computer posing as a 13-year-old boy became the first to pass the Turing Test, which was designed to test a machine's ability to exhibit intelligent behavior that's equal to or indistinguishable from that of a real human. A supercomputer called Eugene Goostman accomplished the feat during Turing Test 2014 held at the Royal Society in London in June.

Eugene Goostman was developed in Russia by a team led by Vladimir Veselov and Eugene Demchenko. To pass the test, a computer must be mistaken for a human more than 30 percent of the time during a series of five-minute keyboard conversations. Eugene was able to convince 33 percent of the human judges that it was human. **—PL**

CyberPower recommends Windows

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Work easy, play hard Windows 8

THE LIST

THE 10 COOLEST THINGS WE SAW AT E3 2014

10 ALIENWARE ALPHA GAMING CONSOLE

With the Steam Machines delayed until next year, Alienware is rebranding its box with Windows, throwing its own 10-foot UI on top, and tossing in an Xbox controller.

9 KOR-FX

VR headsets may allow you to see virtual reality, but the KOR-FX haptic feedback vest will allow you to feel it. Expect those virtual explosions to hit close to home.

8 CIVILIZATION: BEYOND EARTH

Beyond Earth takes players, well, beyond Earth, and has humanity traveling to the outer reaches of space. Expect many new gameplay mechanics to come from the sci-fi theme.

7 CYBERPOWER SYBER SYSTEM

Alienware isn't the only company to release its Steam Machine early. CyberPower's "Windows box" is really cool because it's completely modular.

6 FAR CRY 4

Far Cry 3 was one of our favorite games of 2012; *Far Cry 4* looks to up the ante with a bigger world and a sinister new villain. Did we mention it takes place in the Himalayan mountains?

5 BATMAN: ARKHAM KNIGHT BATMOBILE

Warner Bros. brought a life-sized Batmobile to the E3 show floor to show off the fact that the Batmobile will finally debut in the *Arkham* game series. We want it.

4 THE WITCHER 3

Arguably the most impressive PC game we saw at E3 was *The Witcher 3*. The graphics are jaw-dropping and it looks like a *Game of Thrones* videogame done right.

3 ROCCAT SOVA

Roccat is designing a wireless keyboard-and-mouse combo for your lap, so you can play your PC games on your living room couch. It looks pretty friggin' sweet. (Read more about it on page 93.)

2 EVOLVE

What do you get when you cross *L4D* with aliens? The 4v1 cooperative shooter *Evolve*, that's what! Instead of fighting hordes of zombies, you'll be fighting one giant human-controlled monster.

1 IBUYPOWER STEAM MACHINE

Even with Valve's announced delay, iBuyPower is staying true to its Steam Machine vision. Coupled with a sweet-looking chassis, it will ship with SteamOS and a Steam controller.

HEAD TO

BY **GORDON MAH UNG** EDITOR-IN-CHIEF

Android OS vs. Chrome OS

Windows is dead. Haven't you heard? Yeah, right, we don't believe that for a parsec (although we wouldn't mind if Modern got swallowed alive by a Sarlacc to be slowly digested alive for a thousand years.) Still, for those who are living in their post-PC fantasy, the OS of choice for computing won't be based on Windows.

Since it has been foreseen that Google will rule the entire world, we decided to put the company's two showcase OSes up against each other in a epic sibling rivalry not seen since Boromir vs. Faramir, Thor vs. Loki, and Ferris vs. Jeanie Bueller.

Android OS is flexible, which is great when it's not confusing.

ROUND 1

Price

A large part of Google's OS success hasn't been because of its awesomeness. No. Frankly, we think nothing speaks louder than the almighty dollar in this world. But both are "free," right? So this is tie? Not really. Although Android is technically free since Google doesn't charge device makers for it, there are costs associated with getting devices "certified." Oh, yeah, and then there's Apple and Microsoft, both of which get healthy payouts from device makers through patent lawsuits. Microsoft reportedly makes far more from Android sales than Windows Phone sales. You just generally don't see the price because it's abstracted by carriers. Chrome OS, on the other hand, actually is pretty much free. A top-of-the-line Chromebook is $280, while a top-of-the-line Android phone full retail is usually $600. We're giving this one to Chrome OS because if it's generally cheaper for the builder, it's cheaper for you.

Winner: Chrome OS

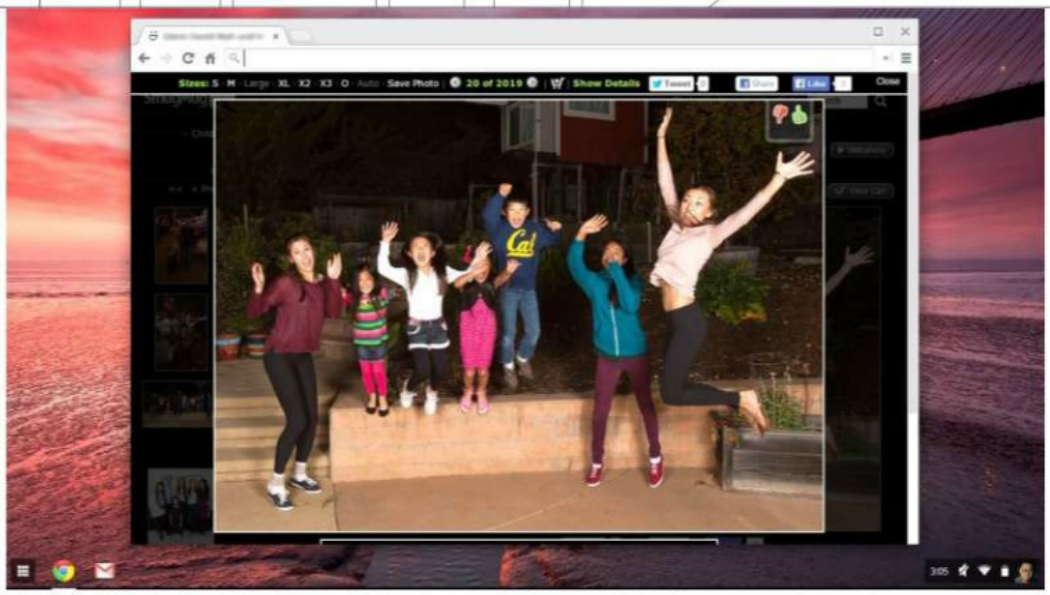
ROUND 2

Security

Both Chrome OS and Android are based on Linux, which generally starts out being inherently more secure than competing mainstream consumer operating systems. A Linux kernel doesn't make it bulletproof, though. If you had to pick between iOS, Windows Phone, and Android for malware issues, Android would be the clear loser. Certainly much of that comes from users opting into malware, pirated apps, and the sheer volume of Android devices out there, but we think it's fair to say that Android has more security problems. Let's not even get into stranded tablets and phones that never see security updates pushed to them. To this date, we know of no credible security breaches of Chrome OS, and when holes are found, they're patched with a speed Android OS users could only dream of. Even the four-year-old (ancient!) original CR-48 gets updates within a few weeks, while a $600 phone from 2014 will be ignored for months (if not years).

Winner: Chrome OS

HEAD



The Chrome OS is so simple that some argue that it doesn't really qualify as an OS.

ROUND 3

Usability

Android is regarded as a power-users operating system. It's malleable and easily bendable to your every desire. Want a widget that alerts you when it's time to take a nap in the conference room? Got it. With skins providing device makers' interpretations on how to make Android "better" (usually for the worse), it's also pretty damned complicated sometimes. In fact, HTC users can't easily navigate Samsung devices without some confusion and vice versa. To get lost or confused in Chrome OS would be a feat of unimaginable proportions because there's just no way to do it. It's on, off, or in the browser for the most part. And an HP or Acer or Toshiba Chromebook? All the same. Down to the interface and keyboard. In fact, we'd argue that generic feel is another knock against it—just not in this category.

Winner: Chrome OS

ROUND 4

Sexiness

Here's something you'll never hear: "Oh. My. Gawd. Is that the new $200 Chromebook? Can I see it so I can stroke its cheap painted plastic skin?!" Outside of the Google employees given free Pixels, Chromebooks have the sex appeal of geriatric sock garters or Limburger cheese. As much as it's a bad tech marketing cliché, break out the latest wonder phone with its 4K glassless 3D screen at a party and you'll get the adoration and attention your lonely soul craves. We honestly don't see that changing, either, because as much as we'll say, "Bah, I don't give two No. 2's about new phones," there's no denying just how mesmerizing it is to check out the latest smartphone in person.

Winner: Android OS

ROUND 5

Application Support

For those who don't know, Chrome OS is pretty much cloud computing. Websites are your apps, and that, Mr. Non-believer, means that every website is technically an app, so there are tens of millions of apps for Chrome OS! So, nyah nyah! The truth is, there are surprisingly more Chrome OS apps that can be run offline and in the browser than you'd expect, but we think it's fair to say that Android's traditional client-based computing, locally run apps, is more fulfilling and far better supported than Chrome OS. To us, Chrome OS "apps" still feel like you're trapped in a browser. Then again, maybe that's the whole point.

Winner: Android OS

And the Winner Is...

This is a shocker to us, because as power users and people who love complicated hardware and devices, we really thought Android OS was going to walk away with it. After all, most of us have wondered just why the hell Android OS isn't being used in clamshell devices instead of that weak-sauce Chrome OS. But when you add up the numbers and divide by 16.7, **Chrome OS** is actually the surprise winner here. Maybe there's a reason Microsoft is more afraid of Chrome OS than Android OS these days.

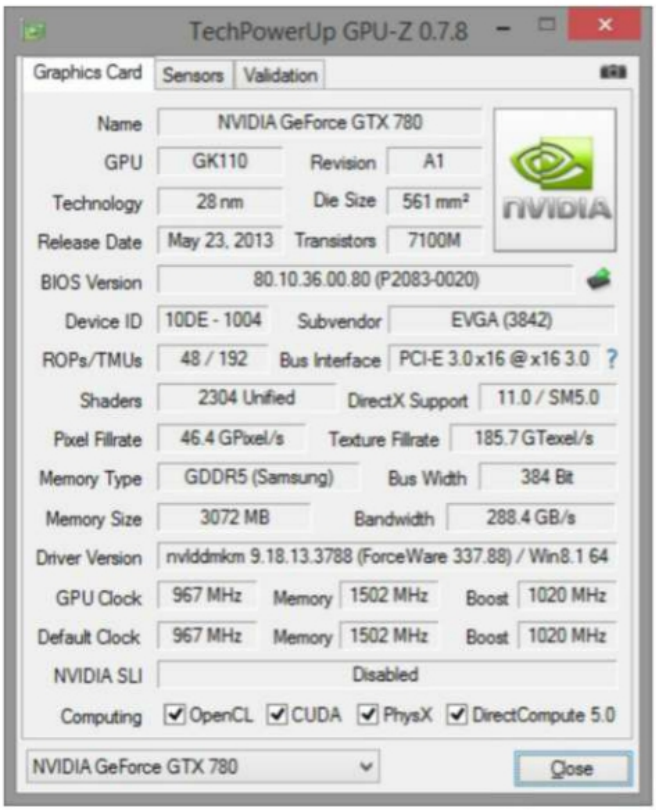
DOCTOR

THIS MONTH THE DOCTOR TACKLES...

> IDing Your GPU
> Surge Protection?
> RAM Configs

Welcome to the Club

I am new to "higher-end" PC gaming and I have a couple of questions. How do I tell what graphics card I have? I have thrown the box away and the only thing I can see on the card is "Direct CUII." The DirectX diagnostic tool, Windows system devices, and AMD Catalyst screens all just say, "AMD Radeon R9 200 series" and not the actual model I have. I don't know if it's an R9 270 or a 290. Second, I currently game on a PS3 on a 42-inch HDTV. What PC games can you recommend that will really showcase the fact that the PC has better graphics than the PS3 and PS4? **—Dave**



GPU-Z is a free utility that will show you more information than you ever wanted to know about your GPU.

THE DOCTOR RESPONDS: To find out which video card you have, you can download GPU-Z (www.techpowerup.com/gpuz) and it will tell you. You can also right-click your "PC" icon, aka "My Computer," and select Properties, then go to Device Manager, expand the tree under Display Adapters, and you should see it there. You should also be able to tell the difference between the R9 270 and 290 by size, as the R9 290 is roughly 11 inches long, whereas the R9 270 is only about nine inches. Or, you can look for the code names for the GPU cores in the utilities, as the R9 290 will be referred to as Hawaii and the R9 270 is called Pitcairn. As far as which games showcase the PC's power, any of the latest titles will do, such as *Battlefield 4*, *Tomb Raider*, *Watch Dogs*, or *Titanfall*. However, the biggest advantage the PC has over consoles is the ability to run at high resolution instead of being limited to whatever the console can do, which is 720p for your PS3 and 1080p for the next-gen consoles. A rig with an R9 270 will probably be stuck at 1080p, but you should be able to turn up some details to make it look better. If you have an R9 290 though, you should be investing in a larger monitor, preferably one that runs at 2560x1440 or so. Once you see a PC game on that huge LCD with all settings maxed, you'll never go back to a console.

How to Stop My Surging

Back in 2007 I came into some money, so I bought the main parts of the 2007 Dream Machine. The only part I've upgraded over the years is the video card. As good as this setup was, it was beginning to show its years, so I decided to build a new machine this year. I purchased your recommended (at the time) best mobo, the Asus X79 Deluxe, along with Core i7-4820K processor, Cooler Master Hyper 212, WD 3TB HD, Critical M500 480GB SSD, 16GB of Ballistix DDR3/1600 RAM, and a Radeon R9 270 Gaming graphics card. I kept my LG Blu-ray player, Ultra 1,000-watt ATX power supply, and Antec Nine Hundred Black Steel ATX case. I am in the military and so my gaming time is limited (usually to only one game at a time). Currently, I am playing *Elder Scrolls Online*. Every time I boot up *ESO* and have the x79 Anti-Surge enabled (UEFI BIOS advanced feature), the computer shuts down. If I turn off the Anti-Surge, I can play the game fine. There have

↘ submit your questions to: doctor@maximumpc.com

been a few times during normal computing the Anti-Surge feature has been triggered, as well. So my question is, is the X79 Anti-Surge feature just too sensitive, or is my Ultra power supply needing to be replaced? If you think my power supply should be replaced, could I have damaged my Mobo by playing with the Anti-Surge feature off?

—Thomas Eddy

THE DOCTOR RESPONDS: The Asus Anti-Surge feature is supposed to shut down the system if it detects abnormal voltage coming to the motherboard. There are three possible problems; the first is easy. Asus says if you're running additional voltage-monitoring tools (software or direct monitoring via probes to the motherboard), this may trigger false positives to the Anti-Surge feature and shut down the machine. The second problem could be that Anti-Surge is known to be a bit finicky, and a PSU that is just a little out of spec or just starting to give up the ghost could be triggering it. This brings us to the third reason: Your PSU is likely the problem. You say this only occurs when you fire up *ESO*, the only game you play. That also means it's the only time your PSU is under its heaviest load, since the graphics card is the biggest power load on the system. This in turn triggers Anti-Surge, and you go dark. You could buy a PSU from a store that allows returns without restocking fees and install the new PSU to see if it resolves your issue. (It will likely solve your problem, but if it's not a PSU issue, the Doc thinks it's kosher to return the new one.) The second solution is to simply turn off Anti-Surge. This option is probably the easiest and cheapest, since hardware is surprisingly sturdy in the Doctor's experience and failing PSUs rarely wreck hardware. Rarely doesn't mean never though, so if you are risk-averse, an updated PSU from a reputable brand may be a good move. Just be advised that you probably don't need anything as beefy as a 1,000W PSU today. You will be fine with a far more moderate and modern PSU, and if you want to save on cash, one in the 650–750W range should work just fine.

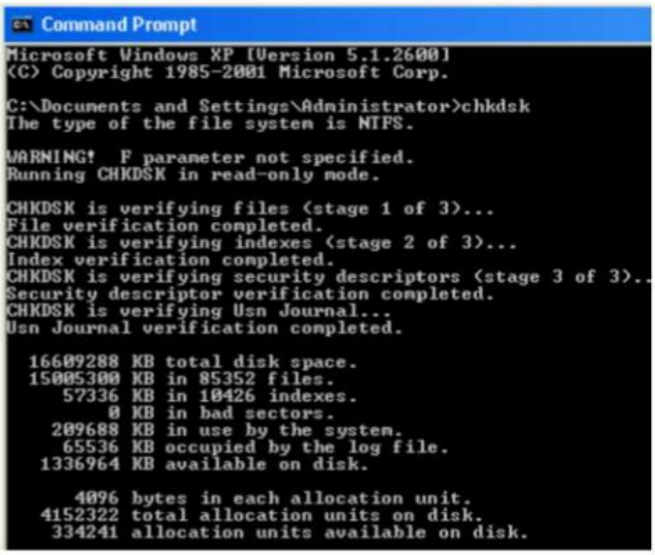
Will It Fk up My dsk?

I work on computers quite often, and Chkdsk is a utility I make frequent use of. However, I recently read it can actually cause more damage to a corrupt drive. I've never had any problems with it (worst case scenario: it didn't help), but I'm a cautious person, especially when I'm working on another person's computer. Because so much of the Internet is unreliable (that was my source), I'm coming to you for advice. Is it ever dangerous to use Chkdsk?

—Justin

THE DOCTOR RESPONDS: For those who don't know what Chkdsk is, it's a free utility that comes with every recent version of Windows and it is, according to Microsoft, "...a tool that checks volumes on your hard disk drive for problems. The tool then tries to repair any problems that it finds. For example, Chkdsk can repair problems related to bad sectors, lost clusters, cross-linked files, and directory errors." So, to summarize, Chkdsk does two things. First, it examines a drive to make sure all the files that are referenced are actually there and can be accessed, and also notes if a sector can't be accessed. Then, once a drive has been examined, the tool can try to "repair" any errors it found, but it will only do this *if you check that option.* Therefore, running Chkdsk by itself is normally not dangerous unless a drive is teetering on the brink of disaster, then yes, any attempt to read a drive's bad sectors reduces the chance of data recovery from those sectors. Since Chkdsk can take a while to run, especially on a failing drive, it may in fact "kill" the drive by continually accessing it. In that case, it can cause data to become unrecoverable. Chkdsk is not a data-recovery tool, it just repairs errors relating to a drive's file structure, but won't recover data from a failing drive. To actually recover inaccessible data, you need special software and it almost always costs money.

One more thing—failing drives need to be treated with the utmost caution, so the first order of business when a drive starts giving you access errors is to make an image or a sector-by-sector copy of it onto a healthy drive. You can then perform your data recovery on the healthy drive. And just in case it isn't clear, you should always, always, always have a backup of important files so that when a drive begins acting funky, you can run repair tools like Chkdsk without worrying about losing important files.


Command Prompt
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.
C:\Documents and Settings\Administrator>chkdsk
The type of the file system is NTFS.
WARNING! F parameter not specified.
Running CHKDSK in read-only mode.
CHKDSK is verifying files (stage 1 of 3)...
File verification completed.
CHKDSK is verifying indexes (stage 2 of 3)...
Index verification completed.
CHKDSK is verifying security descriptors (stage 3 of 3)..
Security descriptor verification completed.
CHKDSK is verifying Usn Journal...
Usn Journal verification completed.
16609288 KB total disk space.
15005300 KB in 85352 files.
57336 KB in 10426 indexes.
0 KB in bad sectors.
209688 KB in use by the system.
65536 KB occupied by the log file.
1336964 KB available on disk.
4096 bytes in each allocation unit.
4152322 total allocation units on disk.
334241 allocation units available on disk.
Chkdsk can "repair" file structures but is not a data-recovery tool.

Are Four DIMMS Better than Two?

I am in the process of buying a new desktop. It will be running Windows 7 Professional 64-bit, an Intel Core i7-4770 processor, and 16GB of DDR3/1600. I have the option of using either four sticks of 4GB or 2 sticks of 8GB. The vendor specs either option at the same price. My initial thought process says go with the 2x8GB option, leaving two memory slots open for a possible upgrade to 32GB sometime in the future (if ever needed).

But then I began wondering if there was any reason that the 4x4GB option might have advantages. Could it be faster? More reliable? Better longevity? Generate less heat? The obvious downside is that I will have to throw away one or more 4GB sticks if I want to increase my memory in the future.

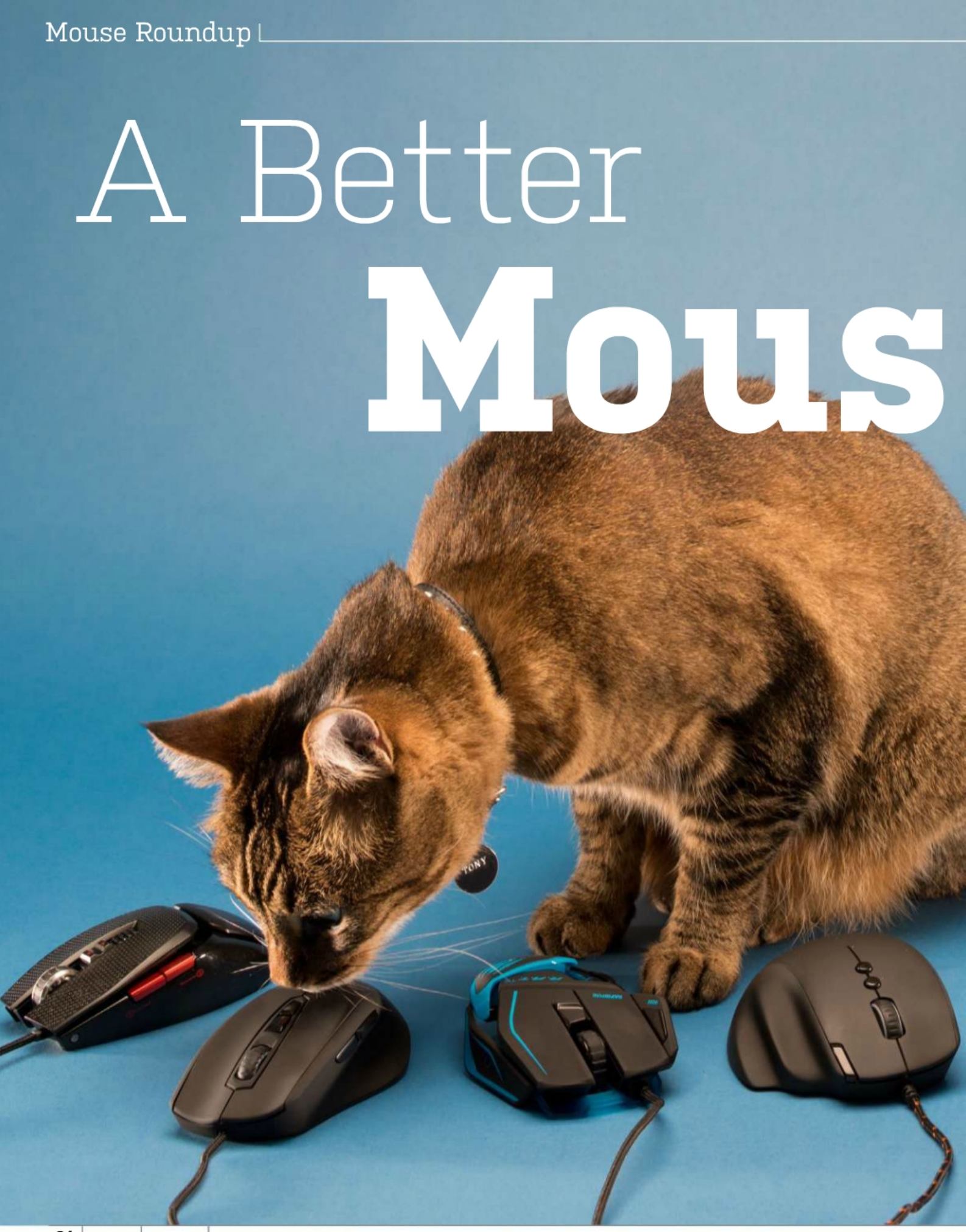
I'm not a gamer but I do want a system that will be fast and reliable for a number of years (my present desktop is 10 years old!). What's your recommendation on the memory choice?

—Peter Anderson

THE DOCTOR RESPONDS: With today's CPUs there's no perceivable advantage between using four RAM modules versus two modules. Typically, though, higher-clocked modules are usually available with lower-capacity modules first. This isn't always true, but generally it is. More modules will also theoretically use more power and increase the chance of failure, since you have four physical modules rather than two physical modules. With some memory controllers, fully loading them by filling all of the modules could result in lower top-end clocks, as well. In the old Athlon 64 days, for example, running four modules would result in lower RAM clock speeds than if you just used two modules.

Since you probably aren't going to be trying to overclock your RAM to DDR3/4290 (the current record), your best course of action is to use two 8GB modules to give you the best upgrade price.

A Better Mous



etrap

PALM ITCHING FOR A BRAND-NEW HIGH-PERFORMANCE GAMING MOUSE? HERE ARE SIX CONTENDERS

BY ALEX CASTLE

WE'RE GOING TO COURT controversy for a moment, and say that your mouse is one of the most important parts of your PC. It's not as central as your CPU and graphics card, or as flashy and obvious as your monitor, but it's the mouse that's the primary point of interface between you and your computer. It's the tool that allows you to direct all of your bleeding-edge hardware—your conductor's baton. And on a more basic level, it's a device that you're in near-constant, bodily contact with. It shapes your experience with your PC much more than you likely give it credit for.

So, don't fall into the common trap of speccing out an awesome new rig and then skimping on the peripherals. Even if a top-notch mouse isn't going to move the needle on your benchmarks, it will have a huge effect on your user experience, and just maybe your k/d ratio in *Titanfall*. In this feature, we've rounded up six high-end gaming mice, and reviewed each on the basis of performance, comfort, build quality, and feature set. This is an excellent crop of mice, so read on, and ask yourself whether you're due for an upgrade.

EVGA TORQ X10

Is this the adjustable mouse lefties have been waiting for?

THE TORQ X10 IS an attempt to take the adjustable gaming mouse concept—which has become very popular in the last three or four years—and apply it to an ambidextrous mouse. Though it sports the modular look, the customization options are limited to increasing the height/arc of the top of the mouse and adding or removing weights. Otherwise, the mouse sports the same assortment of software customization you'd expect from a midrange gaming mouse, including profiles with adjustable sensitivity, key bindings, and lighting effects.

We had a couple of issues with the build quality of the Torq x10. The textured top surface feels a little slippery, and the sides of the device are made of a polished black plastic that almost instantly starts to look grimy and gross. The pairs of thumb buttons on either side of the mouse are a bit unresponsive, although the scroll wheel is very nice.

The other gripe we had with the Torq x10 has to do with the way you swap out the weights. They're located in a compartment on top of the mouse, underneath the sheet of plastic that makes up the left and right click buttons. You have to pry on the back of the panel very, very hard to get it to pop off, and it does so with a disconcerting cracking sound. Perhaps because of this strange setup, the clicking action on the two main buttons is a teeny bit less responsive than we like to see.

Shiny black plastic might look nice in pictures, but it quickly attracts fingerprints.

It's a welcome entry to the market, but unless you're specifically on the lookout for an ambidextrous mouse with the modular look, this wouldn't be our first recommendation.

VERDICT **7**

EVGA TORQ X10

$70, www.evga.com

FUNC MS-3 REVISION 2

Pushing the limits of ergonomics

FUNC IS A NEW entrant into the computer peripheral game, and the MS-3 is one of the first mice it's released. The MS-3 we received for review is a second revision, which purports to fix a number of issues with the original MS-3.

If there's one notable feature about the MS-3, it's its shape. We've seen mice in more-or-less this configuration before (check the Mionix Naos in this very roundup, for instance), but never one that's quite so... grande. The MS-3 is an ergonomic mouse designed for flat-palm grippers, so wide and round that even the large-handed can lay their entire hand, relaxed, on its surface. From the bottom, the mouse looks nearly circular.

Beyond its unique shape, the MS-3 is a fairly standard and nicely equipped gaming mouse. It's got two standard thumb buttons, plus a sensitivity-decreasing sniper button and a bonus thumb button on the flange. Up top it's got a pair of dpi switches and a right-click bonus button. Sensitivity, LED color, key bindings, and macros are all adjustable on a per-profile basis, with the downloadable utility, and onboard memory means you don't need an active driver to use these features. The laser sensor performs admirably.

But really, it all comes back to ergonomics with the MS-3. If you're not a complete palm-gripper, or if you have small hands,

The MS-3 isn't just big—it's heavy. If you pick up and move your mouse a lot, steer clear.

or if you're left handed, or don't like finger ridges, or do like light mice, this is absolutely not for you. If, however, you've been waiting for a big, meaty, ergonomic mouse, the MS-3 could be exactly what you're looking for.

VERDICT **8**

Func MS-3 Revision 2

$60, www.func.net

MIONIX NAOS 7000

A mouse for the laser-haters

THE NAOS 7000 IS a comfortable, ergonomic mouse. Its ridged design give you a place to rest your ring and pinky fingers, and overall build quality is very solid. The primary and secondary click panels are a little narrow for such a wide mouse, but you get used to it quickly, and the clicking mechanism itself is nicely responsive. The mouse wheel is sturdy and requires just the right amount of pressure to move from one click-stop to the next.

The Naos 7000 doesn't pack any surprising extra features, but it does have all the basics covered. It has two thumb buttons, which are nicely placed and have a good clicking action, and a pair of dpi-adjustment buttons on top, which select between three sensitivity profiles. The mouse is plug-and-play, but if you want to customize it you can download an application that lets you choose sensitivity levels, key bindings, and LED color. The Naos has onboard memory, so your settings are used even on another computer.

The Naos is known for its optical sensor, which some people claim is superior for ultra-high-performance competitive gaming. We've never had any performance issues with high-end laser mice, and in general are more comfortable recommending them for most users. The Naos's sensor is responsive, and offers an incredibly-strong-for-optical 7,000 dpi sensitivity, but we had major problems with surface detection. Unlike laser mice, which work well on almost any surface, the Naos was unusable on a number of common desk surfaces, and even on one of the hard-surface mousepads we tested it with.

The Naos 7000 has a rubberized surface that feels great in use. We're always wary of this type of coating, though—it tends to rub off over time.

VERDICT **8**

Mionix Naos 7000

$80, www.mionix.net

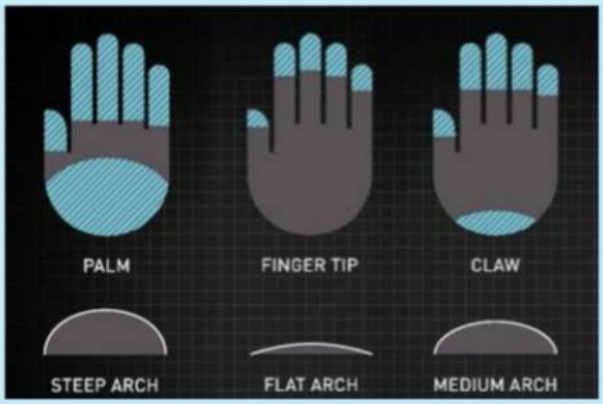
COMING TO GRIPS

YOU'LL NOTICE THAT MANY of our reviews make reference to a user's grip style, and you may find that confusing—after all, isn't there pretty much only one way to hold a mouse? Actually, there's not, and figuring out your personal grip style is one of the most important steps in picking the right mouse for you. Here are the three primary ways people hold their mice:

PALM GRIP: The most common way to hold a mouse, the palm grip means laying your hand down flat across the whole surface of the device. It's an intuitive way to use the mouse, and comfortable, though it makes it take a little longer to register a mouse click. In general, any ergonomic mouse is designed for palm grippers, and the shape is meant to comfortably cradle the hand.

FINGERTIP GRIP: Said to give a competitive advantage, the fingertip grip involves holding the mouse with only the tips of your fingers, not touching it with your palm at all. The arched shape of your fingers lets you actuate the buttons quickly and control the mouse using minute motions, but it can be difficult to get used to, and some find it tiring. Fingertip users are better served with a shorter, lighter mouse, and should avoid ergonomic mice.

CLAW GRIP: A compromise between the two above grips, the claw grip involves controlling the mouse with arched fingers, but resting the very bottom of the palm on the butt end of the mouse. Most mice work well for claw grippers, but again you're better off avoiding ergonomic or very large mice.



One other grip-style consideration is how you press the three main buttons on your mouse. Most users place their index finger on the left mouse button and their middle finger on the right, using one or the other for the scroll wheel as needed, but some users place their ring finger on the right button, and use their middle finger for permanent scroll-wheel duty. If you fall into the latter category, you may find a wider mouse more comfortable.

CORSAIR VENGEANCE M95

A different kind of MMO mouse

THE VENGEANCE M95 IS marketed as an MMO and RTS gaming mouse, and it sports the many customizable buttons usually found on that sort of device. The M95 features two bonus index finger buttons, and a full nine thumb buttons, designed to give you quick access to the many macros and action-bar items used in MMO gameplay. Where some other MMO mice fit all their buttons in a tight grid on the side of the mouse, the M95 spreads them out into a more ergonomic pattern, which curls around a central non-button surface. This surface gives you an easy way to pick up and move the mouse without hitting any buttons, and the ergonomic design makes it easy to find and hit at least four or five of the buttons—an improvement over most MMO mice, where it's difficult to quickly and reliably hit many of the buttons without looking down at the mouse.

Build quality is absolutely top-notch, with a solid-metal core and a nice semi-ergonomic design that will work fine with any grip. The scroll wheel and clicking action both feel responsive and durable. It's very heavy for a wired mouse, so twitch gamers might want to look elsewhere.

The laser sensor in the 95 tracks well and offers sensitivity all the way up to "Who even uses this anyway?" 8,500 dpi. The M95's software is very functional, and allows you to customize the mouse's profiles, with settings for sensitivity, polling rate, key binding, and macro recording. All in all, a confident, competent MMO mouse, with great build quality and all the features we expect.

The flat surface at the center of the thumb buttons is a welcome improvement—it allows you to lift the mouse by pinching with your thumb and pinky, without accidentally hitting any buttons.

VERDICT **9**

Corsair Vengeance M95

$80, www.corsair.com

MAD CATZ RAT TE

This RAT's built for speed

THE RAT TE IS an offshoot of Mad Catz' flagship RAT line of mice with a focus on high-performance competitive play. Though from a distance it looks almost identical to the RAT 7, a modular mouse with a luxury feature set, there are actually quite a few changes just beneath the surface.

The primary difference is that the TE is a much, much lighter mouse than the previous RAT mice. In those devices, industrial-strength, heavy-duty construction was part of the appeal. Here, the entire steel core has been replaced with plastic, and the adjustable weight tray is completely gone. If you're a fan of light mice, this new RAT should be right up your alley—it's very quick to slide around, even using only your fingertips.

The downside to the new all-plastic construction is that the RAT TE isn't as configurable as its cousins. The length is still adjustable, but the width and height no longer are, and there's no way to adjust the weight or side panels. The buttons configuration is still the same, and still very good, with two thumb buttons, a large thumb sniper button, and a dpi rocker and mode switch. Even with the all-plastic construction, build quality on the RAT TE feels great, with good clicking action, a nice scroll wheel, and comfortable rubberized finishes.

We'd still recommend the metal-based RAT mice for most gamers over this, but if you want something leaner and faster, the RAT TE is an excellent choice as well.

The RAT TE features a brand-new blue paint job that looks great, if not exactly subtle.

VERDICT **9**

Mad Catz RAT TE

$80, www.madcatz.com

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GIGABYTE AIVIA URANIUM

More flash than bang

ONE OF THE TRADITIONAL drawbacks of a wireless mouse is the need for a receiver to actually plug into your PC. Some mice use a tiny USB dongle for this purpose, while others attach to an on-desk charging station.

The Uranium attempts to turn the receiver/charger into a selling point, by attaching a small screen to it. This is hardly the first time we've encountered the "put a screen on it" gambit in computer peripherals, but this, to our recollection, is the first time we've seen a free-standing screen with a mouse. The screen is black-and-white, and doesn't run full-on apps like the Razer DeathStalker or the Logitech G19 keyboard. Instead, the Uranium's screen allows you to monitor the mouse's remaining battery life and to adjust profile sensitivity and key bindings on the fly, using the scrollwheel on the mouse itself. The desk station also houses a spring-loaded spool that lets you pull out the charging cable when you need it, and fully retracts it when you don't. It's a pretty fun feature, but it's not exactly practical, and because of the screen, the desk station is substantially larger than average, and takes up two USB slots instead of one (though only one needs to be plugged in if the mouse isn't charging).

The Uranium's screen lets you fine-tune sensitivity and other profile settings on the fly.

The mouse itself feels good, with a tall, long shape that's reasonable for both palm and claw grippers. Most of the mouse is built of a durable-feeling plastic, with a light, rubberized coating on top. Our only real gripe with the construction quality is that the scroll wheel doesn't feel very good. It's the type that can be clicked to either side, which opens up some extra key bindings, but leaves the wheel feeling a little loose in its socket. The turning action itself is also a little soft—it's not a fully clickless track wheel, but it only barely registers each notch.

The Uranium is heavy, thanks to the two (included) rechargeable AA batteries in the underside. Standard AA's work fine as well, so if you need to recharge in a hurry you can just snap in a pair of fresh batteries.

The button layout on the Uranium is fairly standard, with two large thumb switches and a pair of bonus buttons accessible to the index finger. Behind the scroll wheel (which, as previously mentioned, fits in two extra side-to-side bindings), there's a rocker switch that controls dpi, a button to enter configuration mode, and a profile switch button.

Tracking with the Uranium's laser sensor is good, with support for up to 1,000Hz polling and 6,500 dpi. We had no complaints about responsiveness or performance, and never experienced any lag over the wireless connection.

Most of the Uranium's customization can be done using only the mouse and the desk station's screen, but a few of the more advanced options like macro recording and custom screensavers require the downloadable utility. It's fortunate that you don't usually need to use the utility, because it's poorly organized and confusing.

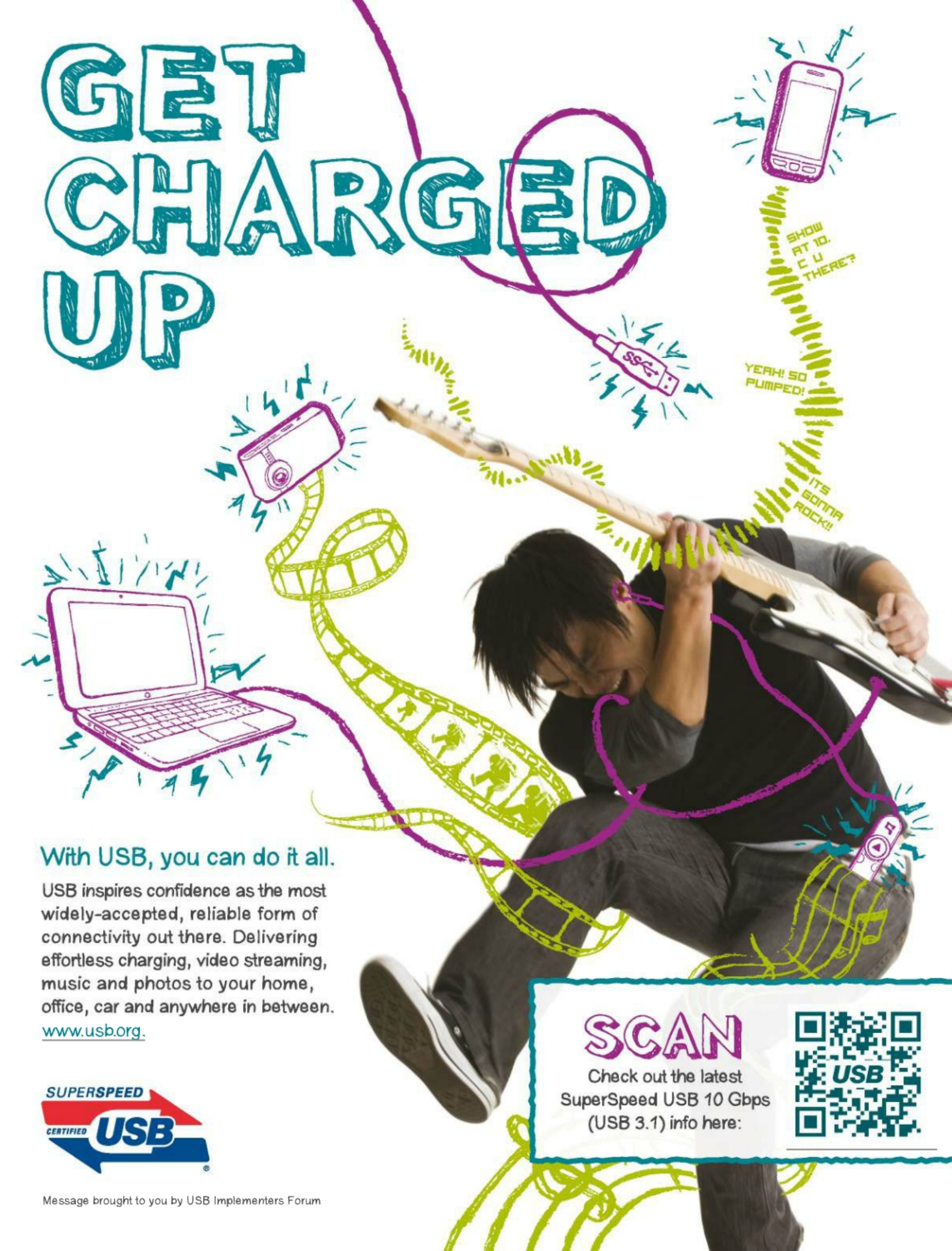
It's a solid mouse overall, but the screen is really just a gimmick, and just doesn't do enough to justify the top-of-the-market $120 price tag. Unless you really want another tiny screen for your rig, you can find a better value elsewhere.

VERDICT **7**

Gigabyte Aivia Uranium

$120, www.gigabyte.com

GET CHARGED UP



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CALIBRATE YOUR MONITOR

DON'T LET A BADLY CALIBRATED MONITOR SPOIL YOUR GAMING AND MOVIES. HERE'S HOW TO GET A HANDLE ON DECEPTIVE DISPLAYS

BY BEN ANDREWS

THE POOR OLD MONITOR. In development terms, the CPU and GPU leave it choking in their digital dust. 4K screen res may be the next big thing, but try extending the pixel density of an HTC One's screen to cover a 27-inch monitor and you'd get the equivalent of 11K. To put it another way, that's 68.4 megapixels and a gaming experience measured in frames per week, but we'll gloss over that.

Seeing as you're likely to be stuck with your dear old display for some time yet, it makes sense to get the best out of it. Correct positioning is a good start, and you'll probably want to fiddle with the brightness and contrast controls to strike a balance between good visibility and a headache, but the fun really begins when you want to ensure colors are accurately displayed. How are you supposed to tell how closely your monitor's idea of red or green matches a predefined benchmark such as the sRGB color space?

Now, hold up. Before you skip straight to the back of the magazine to read the reviews, assuming this kind of nitpicky pixel play is the preserve of Photoshop junkies, consider this: A monitor is your primary means of interacting with your PC. Okay, a mouse and keyboard help, but they're not much help if you can't see anything. A well calibrated monitor is certainly good news for photo editing, but optimizing your screen is also going to give you the best possible gaming and movie experience. Fed up with being at the mercy of shadow-bound enemies everyone else seems to see? Calibrate. Confused why every other scene in your Blu-ray of *The Matrix* looks like it's been filmed through the camera man's Ray-Bans, or why Shrek's skin tone is making him look like the illegitimate love child of Cookie Monster and Smurfette? Yup, you know what to do. Book an eye exam.

So, don't get too hung up on trying to clock that extra 100MHz out of your CPU because, let's face it, you'll never notice the difference. Try showing your monitor some love for a change.

LG

YOU'D HAVE THOUGHT all monitors would come pre-calibrated to display at their best. After all, this isn't just a boob-tube, it's a monitor; it's supposed to give an unbiased, completely accurate view of what's coming out of your graphics card. Trouble is, as you'll know from a trip past any computer storefront, LCD makers have varying ideas of what constitutes optimum image quality. That's fine if all you want to do is kick back and enjoy *Keeping Up with the Kardashians*, but those of us with sophisticated viewing requirements demand more from our monitors.

Monitor calibration ensures the color output from your monitor matches a predefined standard, rather than whatever it happens to display after rolling off the production line. The calibration process doesn't alter anything about the monitor itself, apart from adjusting internal settings like brightness or contrast. Instead, calibration detects the colors emitted by your screen and creates a custom software profile that tells Windows and your graphics drivers how to compensate for any color discrepancies. Your graphics card can distort its output, so what you end up seeing on your monitor conforms to a preset color benchmark such as the sRGB or Adobe RGB color space.

All this messing around is usually left to digital-imaging fanatics who need the utmost consistency for image editing and printing, but we gaming and video enthusiasts can also reap the rewards of a modified monitor. After all, what's the point in setting up the perfect mouse dpi, fine-tuning custom macros, and tweaking graphics quality for maximum frame rates when bad contrast or gamma settings could give you all the vision of gaming behind a welding mask? Likewise, a large part of a game like *Fez*'s visual appeal is its carefully chosen color palette, so it makes sense to banish your monitor's color screw-ups and view these digital landscapes as their designers intended.

Cool monitor backlighting isn't always best for accurate color reproduction.

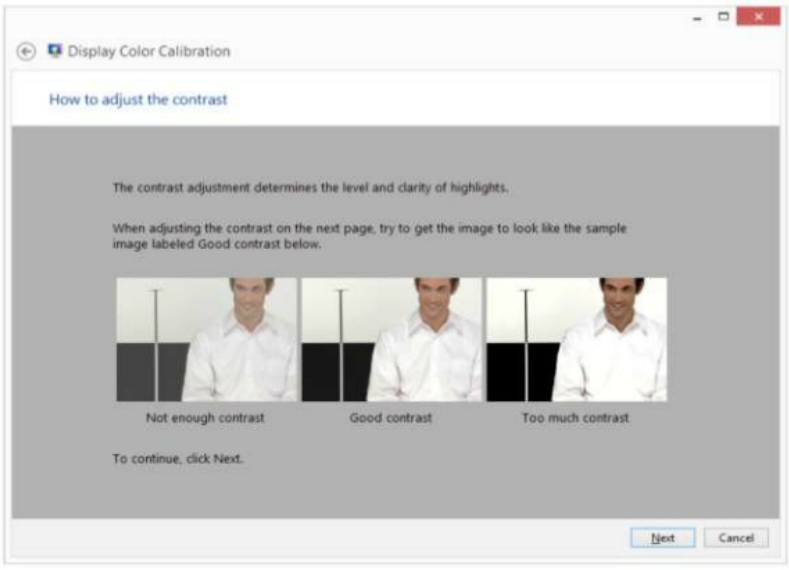
PRE-CALIBRATION CHECKS

Ensuring your screen is up to snuff is easier than you may think. Sure, you can go crazy and drop a month's salary on professional calibration hardware, but that would be insane when you could get so many more interesting gadgets for that price. No, it may surprise you, but it'll cost you nothing to get the basics in order.

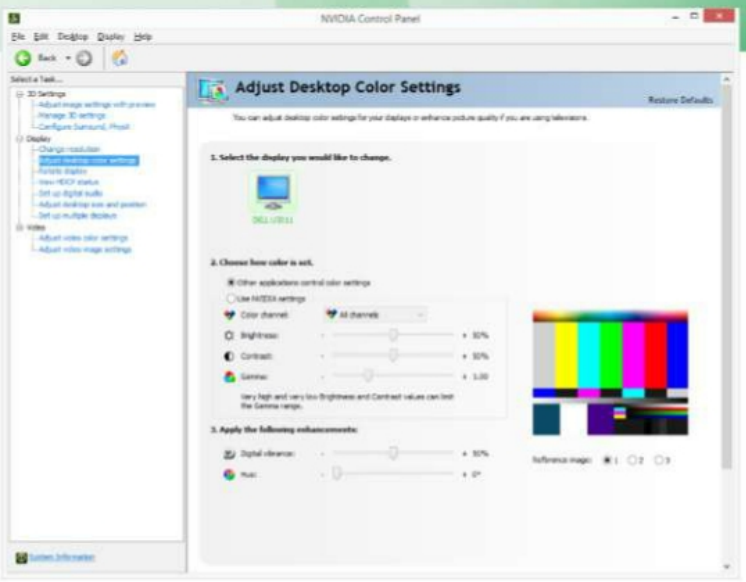
First, make sure your monitor is positioned correctly. Generally, you want the top edge of the screen to be level with your sight line when looking dead ahead. Some TN-based panels may look a bit washed out positioned like this, in which case you should raise the screen until the upper and lower halves can be viewed as clearly as possible.

Ambient lighting also plays a major part in monitor visibility, so wherever possible, try to minimize onscreen reflections and perform any calibration tests in your typical viewing conditions.

At the risk of stating the obvious here, make sure your monitor is set to its native maximum resolution. Back in the day, your bulky old CRT monitor would look crisp at various resolutions, but setting an LCD to anything less than max res results in blurry antialiasing as the monitor struggles to expand the unexpectedly low pixel count coming from your graphics card to fill the available screen space.


Display Color Calibration
How to adjust the contrast
The contrast adjustment determines the level and clarity of highlights.
When adjusting the contrast on the next page, try to get the image to look like the sample image labeled Good contrast below.
Not enough contrast
Good contrast
Too much contrast
To continue, click Next.
Next
Cancel

The Windows calibration tool is basic, but it does the job.



If all else fails, your graphics drivers should come to the rescue.

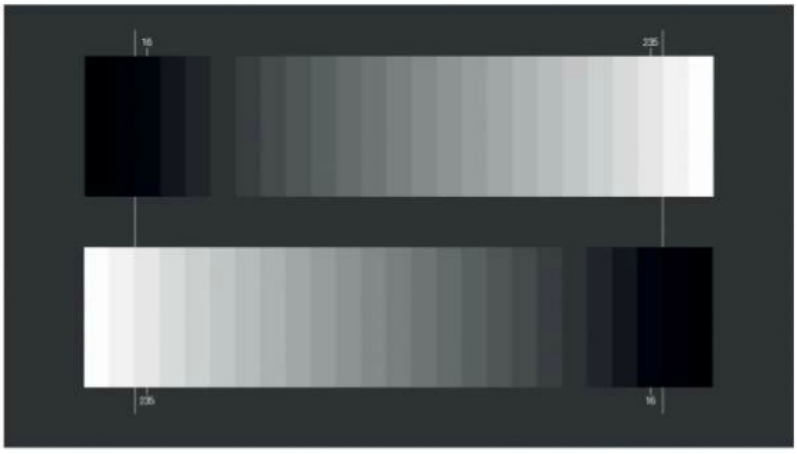
Next, delve into your monitor's own display settings. Some will have more built-in options than others, but hunt around for a color temperature control. This sets the tone—or warmth—of light emitted from each pixel, from a 2,500K temperature that roughly equates to the orangey light you'd expect from a traditional tungsten light bulb, up to the bluish 9,300K (or D93) temperature that many monitors are preset to. This might look fresh and crisp in Word, but games and films are best displayed at a more daylight-balanced color temperature of 6,500K, or D65. Stepping down to this from 9300K is going to look as though the world has turned sepia for a bit, but give it a chance, as colors will be displayed more accurately.

We're almost ready to calibrate, but if you've only just powered up your monitor, it's best to let it "warm up" for at least 20 minutes so the panel's backlighting reaches optimal brightness and emits a consistent color temperature.

WINDOWS CALIBRATION

Windows includes a calibration utility, but it's well hidden. To find it, type **calibrate** into the Start search box in Windows 7, or the Charms search box in Windows 8, then select "Calibrate display color."

The first thing you get to play with is the gamma setting, which is something you've probably seen mentioned on the display options in many a game. Gamma correction has the power to lift murky shadow areas and reveal any sneaky rascals waiting to pounce, or alternatively restore highlight detail from an oversaturated sky. Defining gamma and gamma correction is tricky—so much so that you need



Remind you of *Knight Rider* in black-and-white?

Which Hardware?

CHOOSING THE RIGHT CALIBRATION TOOL

USING WINDOWS OR OTHER SOFTWARE calibration tools will certainly solve any glaring image-quality issues, and will ensure you don't miss anything while gaming. However, to be absolutely sure your monitor's color output is spot-on, you'll need to invest in some hardware.

Two brands have the color calibration market pretty much sewn up: X-Rite Pantone and Datacolor. The former produces one of the most inexpensive colorimeters available, called the ColorMunki Smile. Don't be put off by the silly name, as this effortlessly easy-to-use gadget will give almost as much calibration accuracy as devices costing several times its $100 price tag.

Since the Smile is an entry-level device, you'll need to wait a relatively sluggish five minutes for it to complete the color calibration process, but when it finishes and saves the freshly tweaked color settings to Windows, they'll load automatically every time your system boots up. The calibration software can also be installed on more than one machine, should you want to calibrate your other desktop computers or laptops.

The only downsides with the ColorMunki Smile are that it is unable to calibrate a multi-monitor setup, and it can't measure ambient light to ensure that your monitor's brightness is set appropriately. For that kind of control you'll need to step up to a device such as Datacolor's Spyder 4 Pro. At $170, this is a more serious tool, but it will help you get the very best from your monitor.

Of course, you can spend even more, but then you're into the realm of calibration kits designed to scan not only your monitor, but also color match it with print material. Unless you're a die-hard photo-editing and -printing enthusiast, this kind of money would be far better spent on a quality monitor that's likely to come calibrated fairly accurately right out of the box.

Calibration tools like these will help you get the best from your monitor.

To calibrate properly, one of these gizmos is a must.

to use phrases like "relative luminance" and "nonlinear perceptual response." What matters is that messing with gamma correction is similar to adjusting both brightness and contrast at once. Windows adopts the Three Bears approach to setting the right gamma correction, giving you examples of too much gamma, too little, and just the right amount. All you need to do is tweak one slider to match the preferable midpoint.

Next is the all-important brightness and contrast adjustment, again performed via your monitor's controls and aided by downright dreary Windows images of a man in a white shirt shot against a contrasty background (Microsoft, some choice over the sample images, please? Preferably between Zooey Deschanel and Mila Kunis, but we'll take Clooney too, in the name of gender balance). Daydreaming aside, the sample images you get aren't exactly ideal for the job at hand, so check out the next section to find out how to ensure you've nailed the correct brightness and contrast settings.

The process concludes with Windows attempting to help you set the correct color balance for your screen. You're given three sliders to tune the red, green, and blue color channels, plus a simple grayscale chart to aid the process. It's all easy enough, but not terribly accurate. You can offset any blatant color casts, but if you want to do better, shelling out for calibration hardware is the only way to go.

And that's it. In next to no time you've tuned out any potential image quality hiccups that could get in the way of your gaming, or have you seeing red when you needn't. That's not to say Windows is the last word in software calibration accuracy though, so if you want to go the extra mile, you can set up your own calibration tests and still keep costs at diddly-squat.

DIY CALIBRATION

One issue with calibrating your panel using Windows is that it relies on your monitor having on-board brightness or contrast controls. If yours doesn't, then your graphics driver software will undoubtedly be able to adjust these settings itself, and usually do plenty more besides. For instance, the Nvidia Control Panel includes an option called Digital Vibrance that'll increase color saturation in a more subtle fashion than a traditional saturation slider. This can make a game like *Far Cry 3* look ultra-luscious, but remember that the effect is completely fake and isn't really what monitor calibration is all about.

Returning to the task of tweaking brightness and contrast, you'll still need some form of sample image to know how far to adjust things, and to be honest, shots of semi-naked celebs probably aren't your best bet here. Instead, it's time to turn to the (almost as enticing) grayscale chart. These visual benchmarks tend to be used for printer calibration, but they work just as well for setting up a monitor. A quick Google search should deliver the goods, but make sure you download a chart with at least 20 steps of gray, ranging from pure white to pure black. The objective here is to get every stage on the scale to display clearly, from a crisp white to a deep, inky black. Pay close attention at these extremes, because a monitor with its brightness cranked to

Different Display Technologies

JUST AS CORRECTING the grammatical errors in *Fifty Shades of Grey* isn't going to make it a literary masterpiece, even the fanciest calibration kit won't help a crummy monitor display... well, extra shades of gray.

Thankfully, a large-screen monitor with decent image quality no longer costs the earth, as the smartphone and tablet revolution has done wonders for raising awareness of IPS (in-plane switching) LCD tech and its superior viewing angles and color consistency. Desktop monitor manufactures are now keener than ever to flaunt IPS at lower prices, so you can enjoy the significant image quality boost over an old monitor using a TN (twisted nematic) LCD.

Of course, aside from their comparatively high price, IPS screens used to fall short of TN-based panels when it comes to response time. While IPS still can't match the 1ms or 2ms figures boasted by the fastest TN screens, many can now reach the 6ms mark, which is fast enough to eliminate any noticeable image ghosting from even the most frantic gaming melees.

The fact remains that IPS screens are still pricier than their TN counterparts, but the difference is much smaller than it used to be. That has meant that the third member of the LCD screen-tech trio, VA (vertical alignment) is now becoming a relatively rare breed. Which is a pity, considering VA-based monitors tend to give a good balance between color accuracy, response time, and cost.

Shop around and a 23-inch 1920x1080 IPS screen can be had for as little as $130. If you're feeling flush, then there are plenty of bargain 27-inch 2560x1440 IPS displays to be had right now, too.

Calibration tools are useful, but they can't make a bad monitor great.

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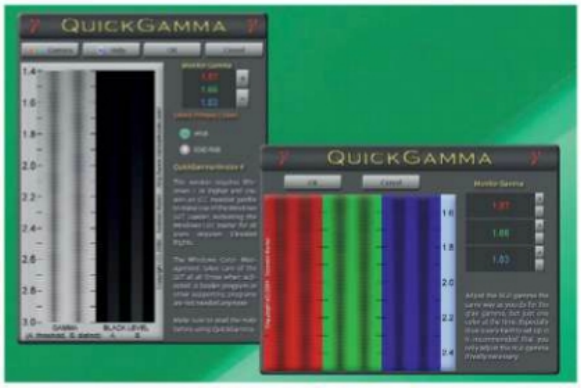


Stare at these patterns long enough and you'll reach Nirvana.

the max will often merge the lightest grays into white, and do the opposite when set too dimly. Most half-decent monitors should be able to display this many shades of gray separately, but if yours can't then try to strike a balance between displaying as many light and dark shades as possible.

Now, turn your attention to gamma correction. The freeware QuickGamma tool is worth a try, as it offers far clearer test patterns than Windows provides (http://quickgamma.de/indexen.html). You'll be met with a headache-inducing chart of alternate fine light and dark gray lines, but sit back and squint so the lines appear as two solid columns. Ideally, the halfway point on the scale, marked 2.2, should display the backing color, and the two columns of alternating lines at the same shade of gray, and your gamma will be spot-on. If the shades blend farther up or down the scale, use the plus and minus buttons on the right-hand side to raise or lower the gamma correction so that the test chart balances at 2.2.

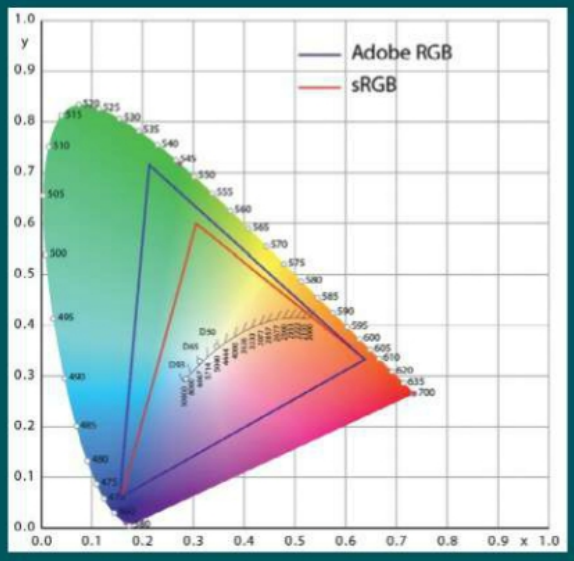
HARDWARE CALIBRATION

No matter how seriously you take this software calibration malarkey, there's always going to be a weak link in the process—worryingly, it's the human eye. Even if you have perfect vision, the eye just isn't an objective judge of color balance or consistency. Take that classic shadow on a checkerboard optical illusion. Stick a Photoshop color picker on both squares and it's clear they're exactly the same shade, but our pathetic noggins just won't see it. To get around the problem and calibrate your screen properly, there really is no alternative but to splash out on a robotic eye. But fear not, as you can pick one up for $100 or less. It won't look like a prop from *Terminator*, though. Pity.

The device in question is related to what car body repair shops use to match paint colors during a repaint. This nifty little gadget is usually about the size of a mouse and only requires a USB connection. Simply hang it over the top of the screen so it rests in the middle of your monitor, where brightness tends to be at its best. Then, corresponding software flashes various colors over a period of several minutes for the all-seeing eye to detect. This then feeds the color data back to the software so it can create a custom Windows color profile for your monitor. More advanced colorimeters can even read ambient light levels to tell you the optimal brightness for your viewing conditions.

Colorimeters aren't the only hardware you can use for monitor calibration. Spectrophotometers look pretty much identical and do the same job, but they can also calibrate your printer because they're capable of analyzing both light emitted from monitors and light reflected off printed color swatches. The only downside is price, as spectrophotometers usually cost considerably more than hardware dedicated solely to monitor calibration.

Once the calibration is done and Windows has the unique color profile for your monitor, you're done except for one thing: Remember that the brightness and color reproduction of any monitor will fluctuate over time, so to keep everything consistent, you should repeat the calibration process once every few months.



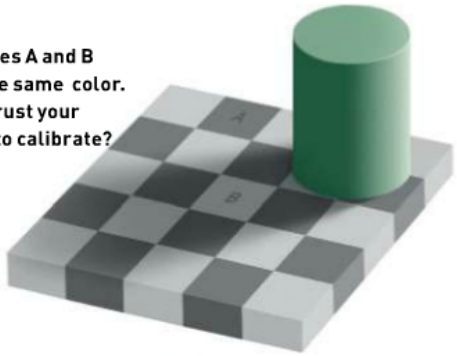
Color theory

HOW CALIBRATION TOOLS ACTUALLY WORK

TO UNDERSTAND color calibration, we need to take a trip back to a time when, ironically, the world was in black-and-white—1931. This was when the first mathematical chart defining the range of colors visible to the human eye was created, dubbed the CIE 1931 Color Space. What's nice about a chart is that you can define coordinates for each color, which is pretty handy for this calibration business.

Ideally, all monitors would be capable of displaying the same color spectrum our eyes can detect, but the cost of such a display would make a Titan SLI setup seem cheap. To create a more realistic standard, less extensive color spaces such as sRGB and Adobe RGB were devised. The vast majority of current monitors should display the sRGB color spectrum, with pro-spec IPS monitors covering the extra colors incorporated by the Adobe RGB color space.

Calibration software displays a range of colors within this spectrum. The colorimeter then detects each color displayed by the monitor, references it with the color's coordinates in the sRGB chart, and works out the correction required to get the monitor's interpretation to sync with its location in the sRGB color space. The software then creates a color profile incorporating all these correction values into one table. This is loaded into the graphics driver so that your graphics card can modify its color output by the amounts specified in the color calibration profile.



Squares A and B are the same color. Still trust your eyes to calibrate?

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dream machine 2014

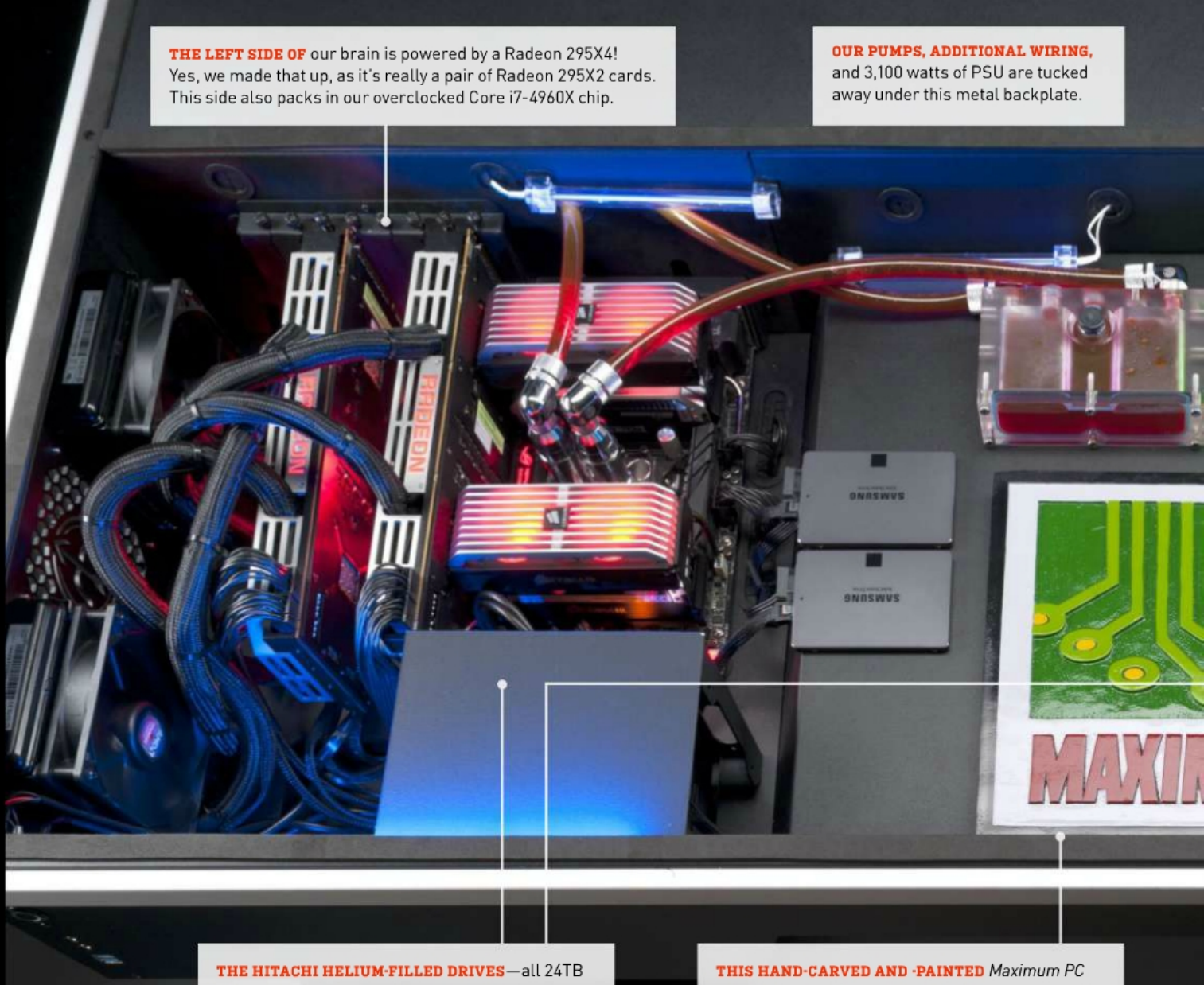
We prove that you can have it all

THERE'S REALLY NOTHING WRONG WITH EXCESS. Who would complain, after all, of having an excess of money, an excess of vacation, or an excess of hugs? We say the same for this year's Dream Machine, which makes absolutely no apologies for having an excessive amount of hardware.

An excessive amount of power.

When we sat down to sketch out this year's Dream Machine, we decided that rather than the normal King Solomon decisions between this CPU or that CPU, this GPU or that GPU, it would be easier (and more entertaining) to just have it all.

Yes, we'd have our own cake, and we'd eat the damned thing, too. We'd actually take it with us and yes, we'd actually get what we want. Thus, we built a Dream Machine that has the best GPUs available from AMD *and* Nvidia. We have both Haswell *and* Ivy Bridge-E. So, sit down and prepare to feast you eyes on the most excessive Dream Machine in our magazine's entire history: The Supreme Ruler of All Dream Machines. *—Maximum PC Staff*



THE LEFT SIDE OF our brain is powered by a Radeon 295X4! Yes, we made that up, as it's really a pair of Radeon 295X2 cards. This side also packs in our overclocked Core i7-4960X chip.

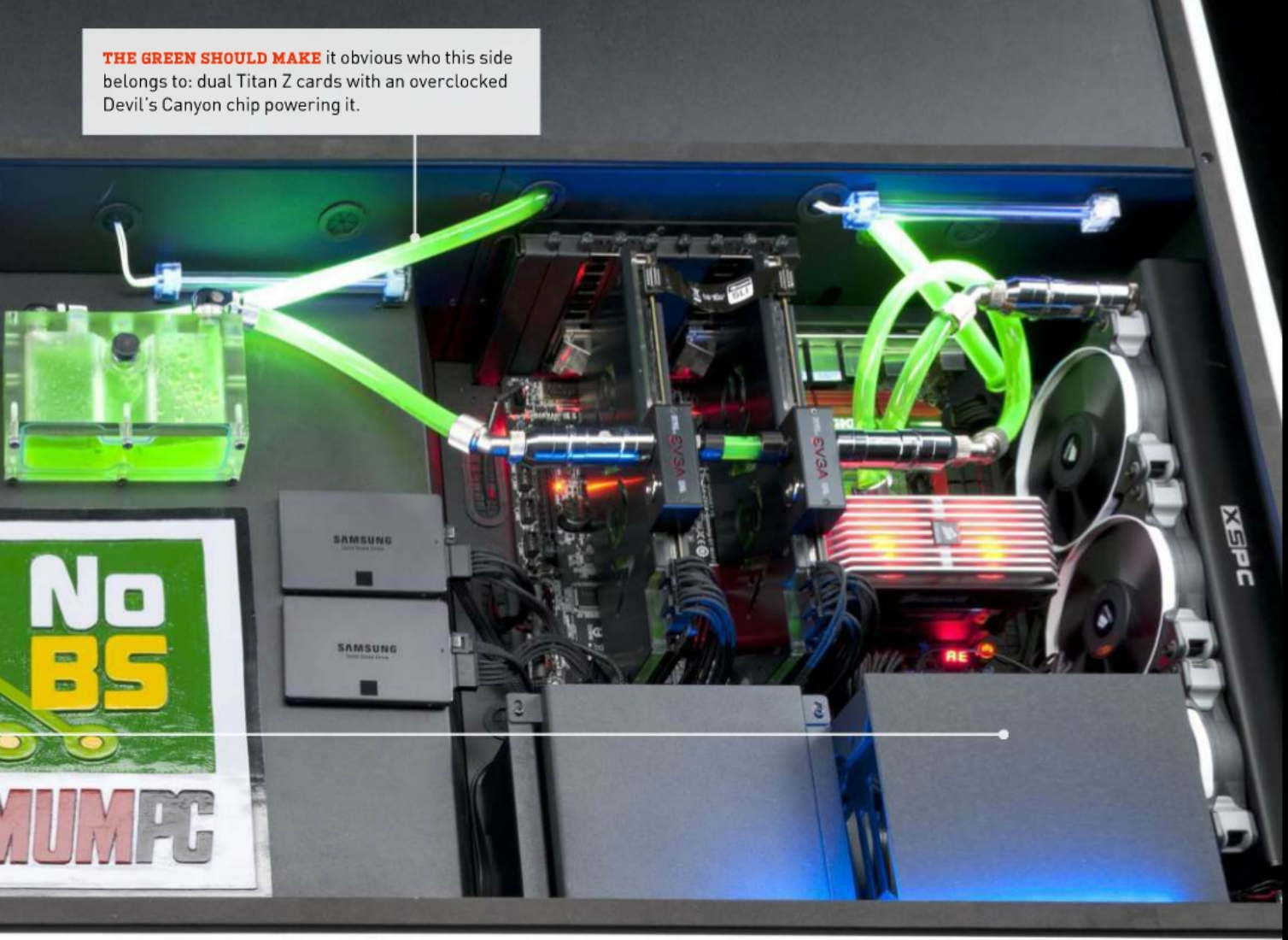
OUR PUMPS, ADDITIONAL WIRING, and 3,100 watts of PSU are tucked away under this metal backplate.

THE HITACHI HELIUM-FILLED DRIVES—all 24TB of them—are tucked under two sheets of Kydex that closely match the powder-coated case.

THIS HAND-CARVED AND -PAINTED *Maximum PC* wooden plaque holds a special place in our hearts because it came from reader and podcast listener, Joe Noll. With that kind of dedication, we knew that one day we'd get a chance to showcase it, and this year's Dream Machine had a perfect spot to do so.

Inside Dream Machine 2014

Unlike some platforms where looks are the only thing that matters, PC users also care about what's inside. See, we are the more sensitive ones, after all. What's inside this year's Dream Machine is an eye-popping display of the best hardware available today. Come have a look inside.



THE GREEN SHOULD MAKE it obvious who this side belongs to: dual Titan Z cards with an overclocked Devil's Canyon chip powering it.

The Price List

Intel Core i7-4790K CPU	www.intel.com	$340
Intel Core i7-4960X CPU	www.intel.com	$1,050
96GB Corsair Dominator Platinum RAM	www.corsair.com	$1,738
2x Radeon R9 295X2 GPUs	www.amd.com	$3,000
2x EVGA GeForce GTX Titan Z Hydro Copper GPUs	www.evga.com	$6,700
Asus Rampage IV Extreme BE	www.asus.com	$500
Gigabyte GA-Z97X-Gaming G1	www.gigabyte.com	$379
4x Hitachi He6 HDDs	www.hitachi.us	$2,400
4x Samsung EVO 1TB SSDs	www.samsung.com	$1,800
2x LG WH16NS40 ODDs	www.lg.com	$135
2x Windows 8.1 Professional Retail	www.microsoft.com	$348
Red Harbinger Cross Desk	www.frozencpu.com	$2,000
Corsair AX1500i X2 PSU	www.corsair.com	$622
EVGA SuperNova 1600 G2 PSU	www.evga.com	$350
Yamaha RX-V477 Receiver	www.yamaha.com	$450
Yamaha NS-PA40	www.yamaha.com	$400
2x Asus PB321Q Ultra HD Monitors	www.asus.com	$4,805
Corsair Vengeance K95 RGB	www.corsair.com	$190
Razer Ouroboros	www.razerzone.com	$150
Qnap TurboNAS TS-470	www.qnap.com	$1,000
Custom Cooling and Parts	www.frozencpu.com	$1,650
		$30,007

CPU No. 1

Intel Core i7-4790K

IT'S HARD TO BELIEVE, but after decades of making CPUs, Intel has finally broken the 4GHz barrier with its Devil's Canyon—which isn't really all that new, of course. It's essentially an Intel Core i7-4770K but made to overclock like a mother. To do that, Intel beefed up the CPU's power delivery with additional capacitors and used a "next-generation polythermal interface material" that's supposed to be far better than current thermal paste or goo in 4770K parts. This, loyal readers, adds up to a chip that *starts* at 4GHz and has a turbo boost of 4.4GHz.

Other than that, it's still the same Haswell microarchitecture we've come to love. The 22nm question, though, is how far could we overclock this chip that was built explicitly for overclocking? A duplicate part in this month's Build It section hit 4.7GHz on a CLC. We're expecting more—but not much more—as few have taken Devil's Canyon's parts above the best Haswell chips. In many ways, the best way to think of Devil's Canyon is that every chip is "good," while it was a crap-shoot with the original Core i7-4770K parts.

CPU No. 2

Intel Core i7-4960X

IN CPU TECHNOLOGY, THE Core i7-4960X has some gray hair, but it has a couple of big advantages over its Haswell sibling. The first is core count. Ivy Bridge-E offers up to 12 threads with six physical cores over the quad-limited Haswell part. Sure, Haswell may be more efficient clock-for-clock, but when the workload requires more CPU threads, Ivy Bridge-E is king. The other big advantage Ivy Bridge-E has over Haswell is in PCIe lanes. Even on the newest Z97 boards, you get 16 PCIe Gen 3.0 lanes to share among the GPUs with another eight weak-sauce PCIe Gen 2.0 lanes from the Z97 chipset. Ivy Bridge-E gives you a fat 40 lanes of PCIe Gen 3.0 plus another 8 PCIe Gen 2.0 in the X79 chipset.

So, despite its age, Ivy Bridge-E is the current king of CPUs for those who need the core and thread count. Yes, it would have been nice to, say, have a Haswell-E and X99 chipset occupying this slot, but at this point, it would have been like wishing we had a Dream Machine built with Skylake and Skylake-E. But let's not get into too much coulda-woulda or sibling rivalries. Both chips here are fighting on the same team this time.

Motherboard No. 1

Gigabyte GA-Z97X-Gaming G1 WIFI-BK

ANYONE WHO HAS BUILT enough rigs has had a DOA board. That's what Gigabyte should all but eliminate with its new Black Edition series. While most motherboards are batch tested or fired up briefly to prevent shipping DOA boards, few are put through any real testing. With Black Edition boards, Gigabyte takes every single motherboard, installs it in a rack with CPU and RAM, and stress-tests it for one week straight before sending it on its merry way.

The GA-Z97X-Gaming G1 WIFI-BK is also dream-worthy in that it supports just about every item on the check list of things you need or want from an LGA1150 mobo. With its PLX chip, you could run four GPUs from Nvidia or AMD. If you can't decide between a Killer NIC or Intel NIC, no worries, it has both. The audio path is separated on the board to reduce interference, and it even has Creative's SoundCore and a TI Burr Brown OPA2134 op amp. The only thing not to like is the price, but this is Dream Machine and when has that ever stopped us?

Motherboard No. 2

Asus Rampage IV Black Edition

THAT OTHER BOARD MAY have a 168-hour "server-grade" burn-in test and sport the Black Edition moniker, but Asus knows that when you call something Black Edition, you actually make it all black. The Rampage IV BE is, of course, based on LGA2011, which has been kicking butt and texting names for years now. The board is decked out with all the bling you'd want today, from four-way GPU support to a separated audio path, CirrusLogic DACs, headphone amp, and that awesome sonic radar (cheater) mode. More importantly, combined with our Core i7-4960X, the Rampage IV Black Edition gives us 40 PCIe lanes in Gen 3.0 mode. While you can run two Radeon 295X2 cards in a Z97 board, it's not actually recommended by AMD. Instead, the company says, if you want big-boy GPUs, you need the big-boy chipset and CPU, too. If you thought our Z97 was pricey, take a knee, because the Rampage IV Black Edition will set you back five hunnert, making it easily one of the most expensive non-workstation-grade motherboards around. That's a good thing, because this year's Dream Machine demands nothing less.

GPU Pair No. 1

AMD Radeon R9 295X4

THERE'S NO DOUBT THAT in this round of the dual-GPU wars, AMD has out-maneuvered its competitors wearing green. And few will disagree that the Radeon R9 295X2 is the winner on gaming performance and also price. At $1,500, the Radeon R9 295X2 is half the price of the Titan Z and edges it in a lot of tests.

So when we spec'ed out this year's rig, we just knew we'd have to have a Radeon R9 295X2 on our Dream Machine Team. But what could make a Radeon R9 295X2 even better? How about a Radeon R9 295 X4? OK, there's no actual such beast, but if you take two Radeon R9 295X2 cards, that's actually X4 based on the rules of marketing.

The R9 295X2 itself is basically a pair of Radeon R9 290X cards, but uses an Asetek custom-designed CLC to keep the GPUs from incinerating your PC. The CLC amazingly keeps the GPU cool and quiet without sounding like a Hoover vacuum. How would CLC X2's do against a pair of Titan Zs with custom cooling? We don't care. Again, both are on the same Dream Machine Team.

GPU Pair No. 2

EVGA GeForce Titan Z

WE KNOW, WE KNOW, anyone who uses a Titan Z in a full-sized desktop rig is nuttier than a fruit cake that's been passed around for four Christmas seasons. To a crew trying to build a Dream Machine designed to shock and awe readers, that's like waving a red flag—or should we say green flag—of insanity. So, to officially piss off those practically minded folks already typing "Dear Editor" emails, we didn't use just one, we used *two* EVGA GeForce GTX Titan Z Hydro Copper cards in Quad SLI. With its factory liquid-cooling jacket, the card features a higher boost clock than the stock Titan Z, and even higher than the Superclocked unit on air. Even better, on liquid, the card is now a dual-slot card GPU, unlike the three-slot air-cooled version, so it'll fit in more boards.

So, which card wins this grudge match? We don't care. That's because in Dream Machine 2014, both pair of cards are fighting for us, not against us. Think of it as an issue where the X-Men and Brotherhood of Evil Mutants fight on the same side against the evil of low frame rates and inadequate computing.

Monitors

Asus PB321Q

WAS THE CPU THE hardest choice this year, or the GPU? Perhaps the PSU or keyboard? Nope. The monitor choice was the most hotly contested item in this year's Dream Machine because there were simply so many directions to go. Surround 4K? Surround G-Sync? A Cinerama Dome of monitors, perhaps?

In the end, we decided that our desk space (literally) and the reality of 4K surround today (it's a pain) meant that we'd tap on an old friend: the Asus PB321Q. The PB321Q graced last year's Dream Machine and it's good enough that we're bringing it back. Of course, one isn't enough for us this year, so we brought along a friend: a second PB321Q panel. Both 32-inch panels pretty much take all the space available on our Red Harbinger Cross Desk.

This panel is still the king of the 4K panels in terms of readability. It's just big enough that you can actually use it without squinting. The panel isn't a basic TN part, either. It uses a Sharp IGZO panel that's glorious to witness.

RAM

Corsair Dominator Platinum

LONG AGO, WE ADOPTED the military mantra of "No slot left behind" for Dream Machine builds. This year we did it again by not leaving a single RAM slot available. For our Ivy Bridge-E box, that means we used 64GB of Corsair Dominator Platinum DDR3/2400 modules. Another 32GB of DDR3/2400 Dominator Platinum modules goes into the Devil's Canyon box. That gives us a grand total of 96GB of RAM in the Dream Machine. For old time's sake, we'll point out that Dream Machine 1996 had 32MB of RAM. We'll say that again: 32 *mega*bytes of RAM.

To spiff them up, we used a set of Corsair's brand new classy-looking RAM coolers, too. As Tom said, "these coolers really tied the room together." Although we're normally dismissive of dedicated RAM coolers, we actually found our RAM getting to uncomfortable levels on our IVB-E box before we installed the Corsair Dominator Airflow Platinum.

SSDs

1TB Samsung EVO

SSDS HAVE BEEN A life-changing affair since their modern iterations hit the streets back in '07 or so. If you're reading this and you're not running one, drop this magazine on the bathroom floor and run—don't walk—to the store to buy one. Since, frankly, SSDs have been performance-gated by the SATA 6Gb/s connection for some time now, we decided to go for capacity with a pair of a pair of 1TB Samsung EVO drives in RAID 0. That gives each machine 2TB of super-wicked-fast SSD, but without the capacity limits that usually have us throwing out ISO and MPEG files well before they deserve to be tossed overboard.

Though it's not SLC or even MLC NAND, Samsung gets around the performance limits with its TLC by buffering writes to a 36GB SLC NAND buffer. And yes, we know some will fear TLC's lower life span but honestly, you will not wear out the TLC memory in an SSD anytime before you pull it from your system and laugh the same way you would at an 80GB hard drive. "What, a 1TB SSD? I have a 10TB USB flash drive!"

HDDs

Hitachi 6TB Ultrastar He6

FEW OF US WOULD argue that hard drives are dead but we agree that in order to even be useful, they need to keep getting bigger. Well, it doesn't get any bigger than Hitachi's Ultrastar He6 HDD. As the name implies, each drive can store 6TB on its seven platters. If you're floored that Hitachi has stuffed seven platters into one unit when five has usually been the limit, know that the company did this through sealing each drive and filling them with helium, which is used to reduce resistance. Since each drive is sealed, it's actually possible to dunk the unit into a non-conductive substance, such as mineral oil, for enhanced cooling—if you're so inclined. Mineral oil wasn't in the cards this time, but a nice, fat 24TB of storage was. To think that just a few years ago, we stuffed four drives into a machine to get to 2TB is mind boggling. So let the downloading begin in earnest and never, ever erase anything again!

Cooling

Custom Cooling

HOW BADASS IS THIS year's Dream Machine? The bill for our cooling costs more than most people's entire builds. Srsly.

With three XSPC AX360 rads, a pair of Swiftech MCP655 pumps, Bitspower quick disconnects, and Bay Reservoirs, Phobya compression fittings, plus two EK Supremacy blocks plus an assortment of lights and doodads, we easily cracked the $1,650 mark just in cooling parts.

As with any plumbing job, it didn't go as smoothly as we hoped. In rushing to get our PC ready for photography, we plumbed up the Titan Zs incorrectly, which required a 10-minute fix and the reward of hands dyed green for a day.

In hindsight, we're also not sure we'd make our picks of the rectangular Bay Reservoirs again. We originally made the choice based on shape as we thought they would look just right on the tray of the Cross Desk. Unfortunately, the reservoirs were smaller than we expected. In hindsight, a pair or four of tube reservoirs might have made a better choice. Still, we're happy with the choices we made. With liquid cooling, it's more expression of art than plumbing, so there is no real wrong answer.

Audio

Yamaha NS-PA40 5.1 Speaker System and RX-V477 Receiver

IF YOU'RE GOING TO BE SITTING at this desk, bathing in the glory of a rig this ambitious, you're not going to prop up a tiny set of 2.1 speakers and call it a day. No, for something like this, you're going to want a surround-sound system. When casting our eye about for options, we ended up turning to Yamaha for a set of relatively affordable 5.1 speakers that'd not only rock our ears, but also manage to remain discreet and not distract from the visual sweetness that is Dream Machine 2014.

The NS-PA40 fits the bill with its sleek front tower speakers, a compact center, and a subwoofer that fits perfectly under our desk. We definitely recommend following the recommended configuration and putting the towers in front and the satellites in the back (though our photo shows just how neatly they fit on our desktop). Paired with the feature-ladden RX-V477 receiver, we're able to switch back and forth between systems (as well as music services and auxiliary devices) in a flash.

Red Harbinger Cross Desk

The Last Desk You'll Ever Buy

WE'LL LET YOU IN on a little inside baseball on how the case gets picked for the Dream Machine. Every year, case vendors float us their latest designs in hopes that we will select their case for use. It's a bit like Vera Wang hoping that Jennifer Lawrence wears one of her strapless jobs at the Oscars.

This year, once we got to Red Harbinger's Cross Desk, we knew what we'd be sashaying across the red carpet in. The Cross Desk is literally the case and the desk. It's no ordinary computer case, either. Made in a limited run of 90 (this is No. 37) the Cross Desk is made of powder-coated aluminum and steel components with a beautiful tempered glass top. It'll fit everything from Mini ITX to HPTX and, of course, you can mount two separate systems if you like.

Keep in mind, this is a modder's case. You shouldn't expect to build into this like a $95 case—there must be some forethought and planning first, but the result is flat-out stunning.

NAS Unit

QNAP TurboNAS TS-470

AFTER WE CEMENTED OUR decision to build two separate and distinct machines, we knew we couldn't leave them as isolated silos. (Although it is cool to have two functional operating systems in one PC—we could have done this by, say, using a virtual machine.) But our real problem was, how do you get the data from the left side to the right side? A NAS unit. Thus we tapped the best NAS unit from our May 2014 roundup to serve as the intermediary between the two: the QNAP TurboNAS TS-470. The QNAP packs a dual-core 2.6GHz Intel part and even has an option to run a 10-gigabit ethernet card. Even handier, the TurboNAS TS-470 fit neatly on the glass shelf under the Red Harbinger Cross Desk.

Optical Disc Drive

LG WH16NS40

TRUE STORY: FOR THE first time ever, Dream Machine 2012 left out the optical drive, and we caught grief from so many readers, you would have thought we'd executed Daryl from the Walking Dead or something (the only person worth a damn in the zombie apocalypse in that show). The optical drive, it seems, wasn't past its prime and to be relegated to the dust bin along with the phonebook and Rolodex. We got the message and this year we went big with not one, but two LGWH16NS40 Blu-ray burners. Not only are these drives capable of burning Blu-rays at 16x speeds, they can also burn BD-XL discs. For those who don't have subscriptions to *Optical Discs Quarterly* or *Maximum Burn*, that's the latest multi-layer Blu-ray spec. Triple-layer BD-XL discs pack in 100GB of data and quad-layer discs gives you 125GB of data. One thing to note: Don't expect to start burning your data to BD-XL discs and handing them out like you do with DVD-Rs. A single triple-layer BD-XL runs from $30 to $50, and we haven't seen a quad-layer disc in the wild yet.

PSU No. 1

Corsair AX1500i

AS WE SAID, AFTER literally running out of power last year with just one PSU, we wanted no power issues this year. So, when Corsair's new AX1500i Titanium-rated PSU came out, we knew that we'd have to have one for at least one of our PSUs. Since it's an intelligent PSU, control over rails, voltage, and fans are easily tweaked from the Corsair Link software. Of the two PSUs here, we actually gave the AX1500i the harder job: driving the pair of Radeon R9 295X2 cards. With its Titanium rating though, this PSU offers 94 percent efficiency with a 50 percent load. That's four percent more at the same loading needed as a gold-rated PSU. As we write this, the PSU is such a hot commodity that it's selling for almost $200 more than its MSRP of $450.

PSU No. 2

EVGA Supernova 1600 G2

FOR OUR POWER-SUPPLY STRATEGY, we decided to adopt a Soviet cold-war mentality. For those who have never read *Jane's Guide to Enthusiast PCs*, the Sovs always built their weapon systems with a backup plan in mind. First, they'd build a guided missile cruiser using all the latest technology available. And then, they'd build a second cruiser with tried-and-true technology, just in case there were issues. The EVGA Supernova G2 fills that role. It's pretty much a brutal metal box of power with its 1600 watts. There's also no fancy digital control or the ability to change the rail configuration (it's a pair of 133.3-amp rails for 12 volts) on the fly. It is fully modular, gold rated, and comes with a ten-year warranty, so really, this is our safe bet this year.

Keyboard

Corsair K95 RGB

A $3,300 GPU, CUSTOM liquid cooling, and 24TB of storage is interesting, but the truly mesmerizing part in this year's Dream Machine is easily Corsair's brand-new K95 RGB. This mechanical keyboard lets you program every single key's color independently. How many colors? How about 16.8 million. You won't just pick red, white, and blue, either; the K95GB allows programmability of the colors so as you type the keys can "splash" or flow. It's truly the most spectacular keyboard available today for those into backlit keyboards. Eventually, Corsair hopes to create an API so a game could hook into the keyboard and allow the keys to change from, say, green to yellow to red as your health plummets in a game.

Mouse

Razer Ouroboros

IT'S NO SURPRISE THE Razer Ouroboros won the last mouse showdown we had, and there's nothing to show it's still not one of the top picks in mice, if not the top pick for those into customization. You can swap out the side plates using a simple magnetic system, and adjust the angle of the palm rest. It runs on a single AA nickel metal hydride cell, but can also be run wired if the batteries flat. Even cooler, when not in use, you rest the Ouroboros on a slick stand that presents the mouse as a work of art on your desk. Basically, it's a 9 Kick Ass mouse and well worthy of a Dream Machine.

ASUS recommends Windows.

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the way we were

THE ORIGINAL DREAM MACHINE was born in the September issue of *boot* magazine 18 years ago, and set the standard for the no-holds-barred approach we've taken to the Dream Machine ever since. What did that Ultimate PC of 1996 have in it? A 200MHz Pentium, a pair of gigantic 4MB EDO SIMMs, a Matrox Millennium with a 4MB frame buffer, and a whopping Quantum Atlas 2GB hard drive. Plus a Zip drive, an Adaptec 3940UW SCSI card, Sound Blaster AWE32, and Toshiba CD-ROM drive.

Yes, we've come a long way, baby, but the journey has been the fun part. Certainly the Dream Machine isn't a measure of mainstream PCs, but it does chart the bleeding edge, which, as we know, eventually trickles down. At one time, for example, the 2000 Dream Machine's exotic core count of two 1GHz Pentium IIIs, 512MB of RAM, and 111GB of hard-drive storage probably seemed out of reach to everyone. By 2005, dual-core CPUs had become commonplace.

Thus it's fun to chart the progress of thread count, total RAM, hard-drive capacity, and core counts from 1996 until 2014, and to look for patterns. Clock speeds, for example, are quite interesting. It's a bit misleading, as clock speeds aren't indicative on their own without considering the microarchitecture of the chip, but we went from 200MHz in 1996 to 300MHz in 1997, and by 2004 we had hit the 4GHz barrier. Since then it actually dipped as we went away from the long-pipeline, high-clock microarchitecture of NetBurst aka Pentium 4 back to Core 2. But for the most part, we've been pretty much stuck at the 4GHz to 5GHz range—even with custom liquid cooling and hybrid-Peltier/closed-loop coolers, as well.

On the thread and core count, we've actually seen a nice progression. In pure thread count, except for the dual P-III box of 2000, we ran single-threaded machines until 2005, when we ran with two dual-core Opteron CPUs. From there, it was dual cores, then quad cores, six cores, and even an eight-core Dream Machine. The outlier was the 2010 Dream Machine that used a pair of six-core Nehalem Xeons to give that box 24-threads of computing.

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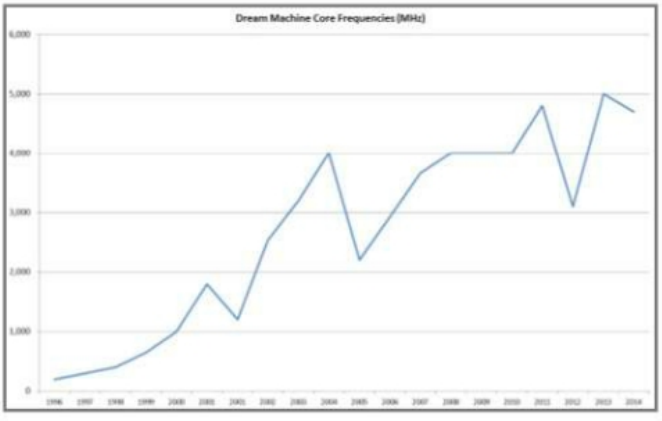
01

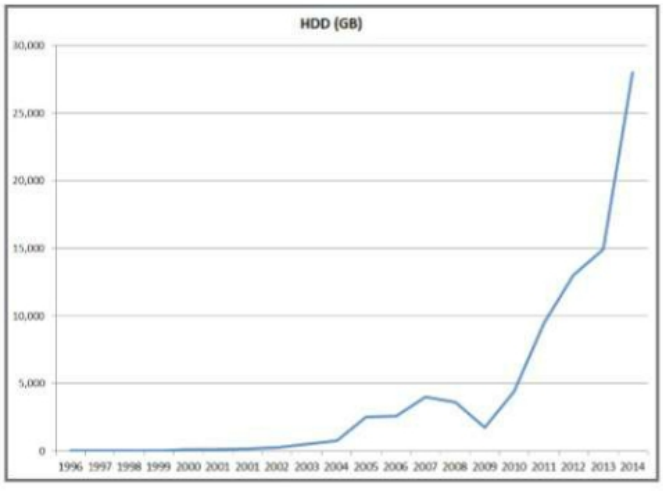
And what of price? Our first Dream Machine set us back a cool five grand. Will DM2014's $30,000 pricetag seem diminutive 18 years on?

System RAM is another nice progression. For the most part, it predictably doubled from 8MB to 64MB and then 128MB, and so on. By 2011, we were running 16GB, and then 64GB. We did have a build in 2010 that had 24GB, but that was a dual-Xeon rig and artificially increased the RAM. The same can be said for this year, which has 96GB in the PC, but is really two separate builds inside.

We could go on for hours looking at the previous machine's specs for fun—such as HDD capacity, which has gone from 2GB to 28TB in 18 years—but we don't want to keep you from the main attraction: how Dream Machine 2014 performed.



Perhaps this is Einstein's new Theory of Clock Blocking: We've never broken far past the 5GHz barrier in 18 years of trying.



With this chart, we foresee next year's Dream Machine smashing through the 30TB barrier.

Future

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Dream Machine 2014: The Buddy System

With great power comes great responsibility… to massively overclock

ALL THIS HARDWARE WOULDN'T mean diddly without the benchmarks to back them up, so this is truly where the rubber meets the road for every Dream Machine. We aim to be the fastest—or at least rub shoulders with the fastest production PCs we see. So, did we make it this year?

First, the Dream Machine is a regular reminder of the magic of water cooling. For example, the air-cooled stock version of a GTX Titan Z has a 705MHz core clock speed. We ran the water-cooled version at about 900MHz, which means that we hit nearly 1,100MHz when the card hit its "boost" clock. We also bumped the memory from 1,750MHz to 1,950MHz. Pair that with a Devil's Canyon CPU overclocked to 4.8GHz, throw in 32GB of RAM clocked at 2,133MHz, and baby, you got a stew going.

We were able to hit nearly 200fps in *Batman: Arkham City*, running at 2560x1600 with 8xAA and every effect besides PhysX maxed out. At 3840x2160, we brought it down to 2xAA, since more than that would be virtually undetectable at that point. Still got 180fps. Our 295X2s got over 15,000 points in 3DMark's "Fire Strike Extreme" test.

The Devil's Canyon system did much better with *Batman* than last year's Dream Machine, despite reliable reports that a single Titan Z doesn't have the oomph of two GTX Titans. How? In short, we ran out of extra power for overclocking last time. The new system had hundreds of bonus watts, so the only limit was our ingenuity. Devil's Canyon is also much newer, so it offers more efficient instructions per clock efficiency. *Batman* doesn't use a lot of CPU processing threads anyway, so Sandy Bridge-E's two additional cores go largely unused here.

Ultimately, if you wanted to be predictable, four Titan Blacks would have been the best choice for pure performance, but we liked the symmetry of two dual-GPU cards in each system—and we couldn't pass up the opportunity to play with $6,700 in GPUs. Would you?

The other system ran Intel's newer Ivy Bridge-E chip, but physical changes to the chip have lowered the overclock ceiling over last year's Sandy Bridge-E part. Asus tested 45 Core i7-4960X Ivy Bridge-E chips, and only one hit 4.8GHz. Another 20 percent hit 4.7GHz. Our chip binned in at 4.6GHz. Despite its reputation as a beast—and it is—we did hit an overclock limit. The best we could see was a 50MHz overclock on the X2 cards. But remember: the X2 cards could belt out enough frame rates that they could hang with the Titan Zs in gaming. And you can buy both X2s for the price of a single Titan Z.

The 64-bit question is if we stood with the badass PCs we've see in the last few months, or if we got melted by them. The good news is that our scores are competitive, but we'll be honest, the Digital Storm Aventum II we reviewed in January with its overclocked Core i7-4960X was still out of reach by a couple of percent in the CPU tests. Likewise, Origin PC's Genesis from the August issue was tough to beat too, with its four-way liquid-cooled GeForce GTX 780 Ti cards. Dream Machine doesn't get spanked, but those burly rigs are not to be dismissed.

If there's any drawback to this dual-computer system, it's that you can't put a full load on both PCs at the same time, unless their power supplies are plugged into two completely separate circuits. Overall, we'd say that we're pretty satisfied with this year's Dream Machine. We'll probably have to build next year's Dream Machine on the moon to surpass it.

BENCHMARKS (LEFT SIDE)

	ZERO-POINT	
Premiere Pro CS6 (sec)	2,000	2,012 (-1%)
Stitch.Efx 2.0 (sec)	831	671
ProShow Producer 5.0 (sec)	1,446	1,144
x264 HD 5.0 (fps)	21.1	20.9 (-1%)
Batman: Arkham City (fps)	76	193 (154%)
3DMark 11	5,847	16,298 (179%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our current desktop test bed consists of a hexa-core 3.2GHz Core i7-3930K 3.8GHz, 8GB of Corsair DDR3/1600, on an Asus Sabertooth X79 motherboard. We are running a GeForce GTX 690, an OCZ Vertex 3 SSD, and 64-bit Windows 7 Professional.

BENCHMARKS (RIGHT SIDE)

	ZERO-POINT	
Premiere Pro CS6 (sec)	2,000	1,674
Stitch.Efx 2.0 (sec)	831	694
ProShow Producer 5.0 (sec)	1,446	1,219
x264 HD 5.0 (fps)	21.1	26.2
Batman: Arkham City (fps)	76	196 (158%)
3DMark 11	5,847	13,771 (136%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our current desktop test bed consists of a hexa-core 3.2GHz Core i7-3930K 3.8GHz, 8GB of Corsair DDR3/1600, on an Asus Sabertooth X79 motherboard. We are running a GeForce GTX 690, an OCZ Vertex 3 SSD, and 64-bit Windows 7 Professional.

IFIXIT presents:

AUTOPSY

THIS MONTH WE DISSECT...

Xbox One Kinect

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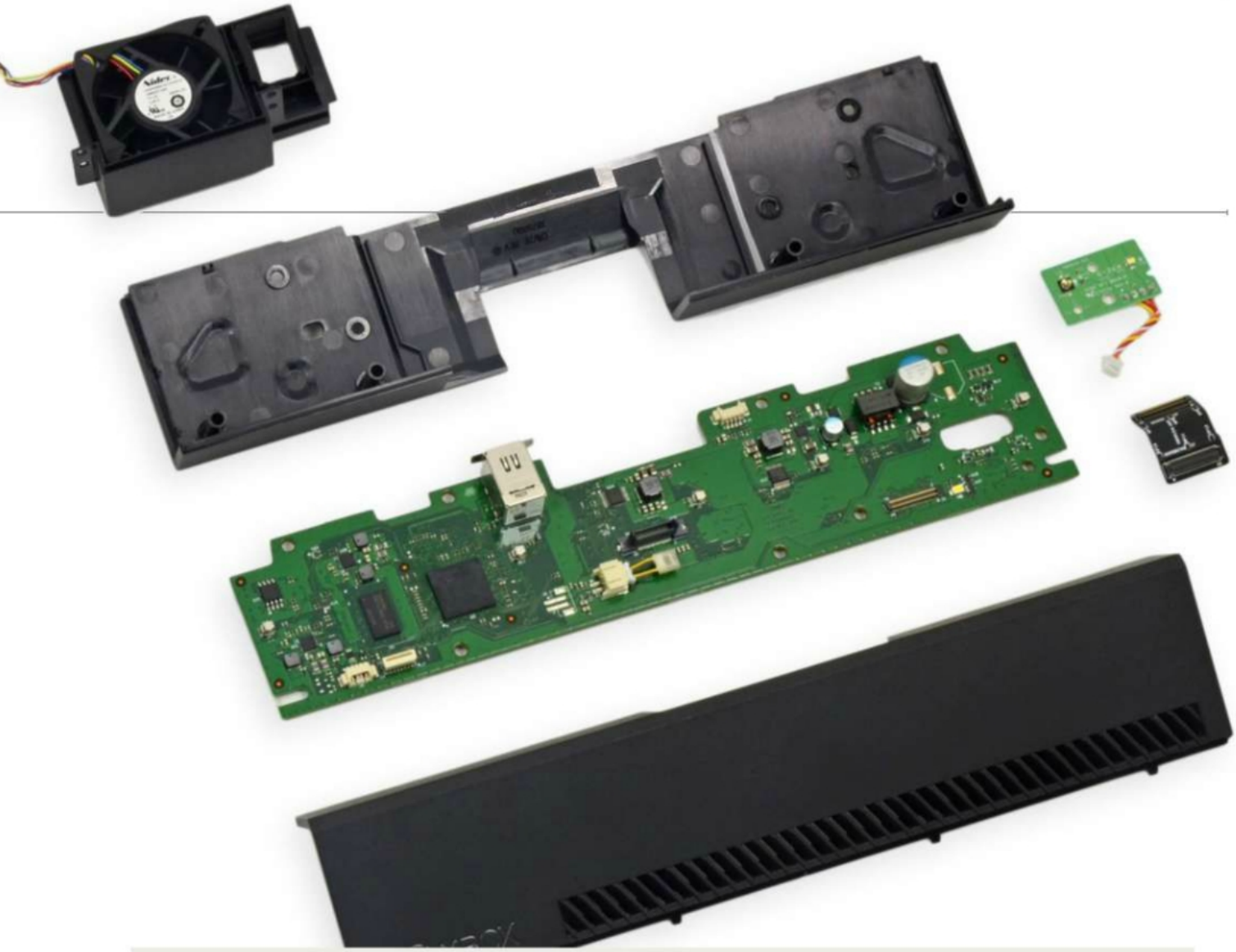

BACKGROUND:

Its predecessor may not have revolutionized gaming the way Microsoft foretold, but the Xbox One Kinect (like its older sibling) could pop up in an operating room or physical-therapy office near you soon enough. Let's see just how "the next generation" looks like up close and in pieces.

MAJOR TECH SPECS:

- 1080p wide-angle camera
- Active infrared camera
- Multi-microphone array with noise cancellation and voice command
- Processing capability of 2 gigabits of environmental data per second
- Samsung K4B1G1646G 1Gb (128 MB) DDR3 SDRAM

KEY FINDINGS:

- Microsoft has designated the Xbox One Kinect as model 1520.
- The 5-volt DC fan is manufactured by Nidec and is labeled as U40R05MS1A7-57A07A.
- A Microsoft X871141-001—the folks at Chipworks.com say this "replaces the Prime Sense chip used in the first Kinect."
- The front side's circuitry includes the Texas Instruments TPS54325, which the evil geniuses at Chipworks say is an adaptive on-time D-CAP2™ mode synchronous buck converter.
- The frame bracket also serves as a heat sink, as evidenced by the adhered thermal pads.
- Pretty purple filters cover what appear to be the three IR blasters. Microsoft is claiming three times the fidelity of the previous Kinect. Microsoft also claims new Active IR technology, enabling your Kinect to see you in the dark—seemingly the same as the night-vision mode on every camcorder since the '90s.
- Suspects one to three for the IR projectors are: TI MV339I Low-Voltage Comparator, Intersil 583 02DRTZ H328CP, NB3L 14S RZB.
- Repairability Score: 6 out of 10 (10 is easiest to repair). While there isn't much to fix inside, most components are modular and held in place with screws. If you need to replace one of the 8 million cameras, you can. But if you want to do the same for the three little IR blasters in the center of the sensor bar, not so much. Those are held in place with soldered-in straps. Screws hidden under tamper-evident tape and fussy clips make it tricky to get inside. The same screw types from the original Kinect are back, including one repair-inhibiting T10 Security bit.

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HOW TO

STEP-BY-STEP GUIDES TO IMPROVING YOUR PC

WINDOWS TIP OF THE MONTH

STAY ON TIME WITH ALARMS IN WINDOWS 8.1

A feature you might have missed in Windows 8.1 is the new, built-in Alarms app. It's pretty basic, but it allows you to set as many alarms as you want, and have them repeat as often as you want. It also includes a stopwatch and timer, and the user interface is very modern and clean. To use it, just got to the Start screen, type in **alarms**, and hit enter.

MAKE - USE - CREATE

66 Run Android on Your PC

68 Use Steam In-Home Streaming

ALEX CASTLE
CONTRIBUTING EDITOR

WHAT HAPPENED TO TRUECRYPT?

IN THE ANNALS of the *Maximum PC* How-To section, there are a couple of software utilities that we come back to again and again. These are programs that are free and so incredibly useful that I think every PC user should know about them and have them on their system. Maybe the best example is TrueCrypt, the venerable open-source cryptography utility.

Unfortunately, TrueCrypt has been the subject of some drama recently, as the developers posted a mysterious note to the project's homepage, saying that they would be ceasing development, and suggesting that the software should no longer be used. So, what should you do?

For full-disk encryption, your best option is now BitLocker, which is easy to use and available on the Pro and Enterprise editions of Windows 8. If you just use TrueCrypt to create password-protected volumes, it's probably all right to continue using the last stable version. A verified version of that can be found at http://bit.ly/MPC_truecrypt. Hopefully, a new open-source cryptography program will be developed soon.

↘ submit your How To project idea to: comments@maximumpc.com

Run Android on Your PC

YOU'LL NEED THIS

VIRTUALBOX

This free virtualization software lets you run a virtual computer on your PC. Get it at www.virtualbox.org.

ANDROID

To try Android, you'll need a copy of the operating system. It's available at www.android-x86.org.

ARE YOU INTERESTED in getting a new Android phone or tablet, but want to road test it before you make a purchase? Thanks to free virtualization software for your PC, you can do just that. By setting up a VirtualBox machine, you'll be able to install the latest version of Android—4.4 (KitKat)—on your PC and test it without paying a penny. If you log in with your Google account, you'll be able to access the Play Store and install apps, too.

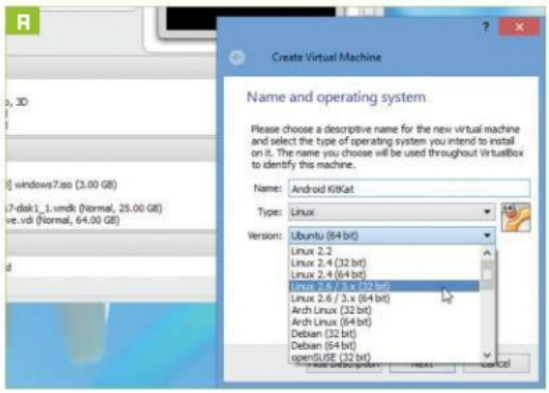
You'll need a PC with at least 1GB RAM (preferably 2GB or more), and it will also need to support hardware virtualization. A free tool like Speccy (available from www.piriform.com/speccy) will be able to tell you if it can. Download Speccy, then select CPU in the left-hand pane, and check the Virtualization entry. If it's supported, but disabled, you'll need to venture into your PC's BIOS or UEFI setup to switch it on. –NICK PEERS

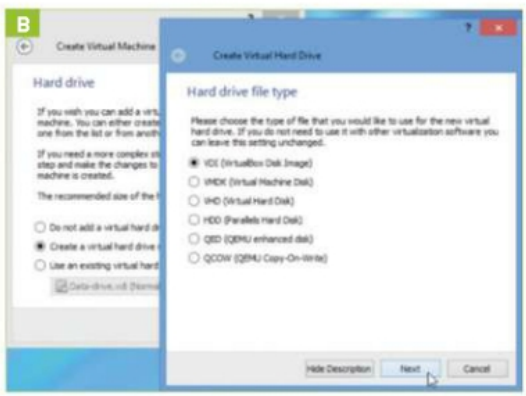
1 SET UP A NEW VIRTUAL MACHINE

Go to www.android-x86.org, click Download, and choose the latest Android-x86 4.4 build. Save the ISO file to your hard drive. It's not very big—294MB—so it should download quickly. If you don't already have VirtualBox, you'll need to install it; you can find it for free at www.virtualbox.org. Stick with the default settings during installation and click Yes when warned about network interfaces. Once installed, let the program launch.

» Click New, and give your virtual machine (VM) a suitable name—Android KitKat, for example. Click the Type drop-down menu and choose Linux. Select the Version drop-down menu (Image A) and choose "Linux 2.6/3.x (32-bit)." Click Next. When prompted to set the memory size, type **1024MB** into the box if your PC has at least 2GB of memory. Click Next again.

» Leave "Create a virtual hard drive now" selected and click Create. Leave the default VDI choice selected and click Next (Image B). Leave "Dynamically allocated" selected; this will prevent your hard drive from using all available space until it needs to. Click Next. For file location and size, 8GB can be accepted. If you have space to spare, you can push this up if you're so inclined. Click Create.


A
Create Virtual Machine
Name and operating system
Please choose a descriptive name for the new virtual machine and select the type of operating system you intend to install on it. The name you choose will be used throughout VirtualBox to identify this machine.
Name: Android KitKat
Type: Linux
Version: Ubuntu (64 bit)
Linux 2.2
Linux 2.4 (32 bit)
Linux 2.4 (64 bit)
Linux 2.6 / 3.x (32 bit)
Linux 2.6 / 3.x (64 bit)
Arch Linux (32 bit)
Arch Linux (64 bit)
Debian (32 bit)
Debian (64 bit)
openSUSE (32 bit)



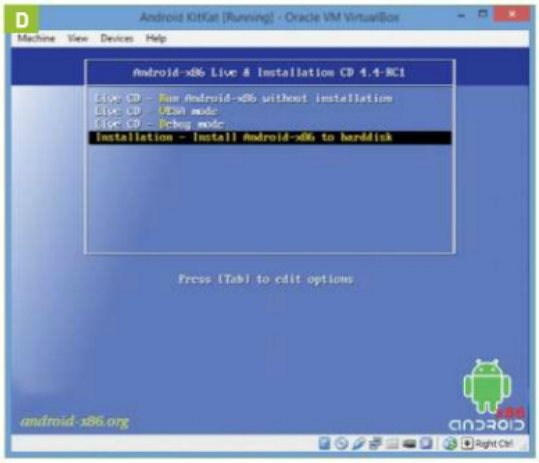
2 CONFIGURE FOR ANDROID

You'll then return to the main screen, where your new VM will be displayed. It's not ready yet, though. Select it and click Settings. On the left, select System. Next, switch to the Advanced tab and tick both boxes—if neither box is available or the tab itself is greyed out, then your PC doesn't support hardware virtualization. Therefore, it won't be able to run Android.

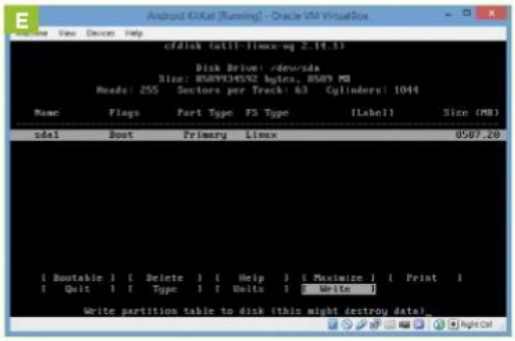
Switch to the Motherboard tab. Uncheck Floppy, then move "Hard disk" to the top using the up arrow key. Now, select Storage on the left. Click "Empty CD," then click the CD button to the right of "IDE Secondary Master," and select "Choose a virtual CD/DVD disk file." Browse to your Downloads folder, select the downloaded ISO file, and click Open, followed by OK to complete the process (Image C).

3 INSTALL THE ANDROID OS

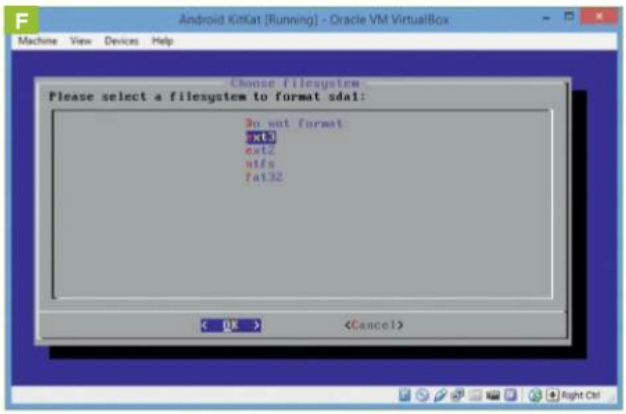
With your Android KitKat machine selected, click the Start button. A new window will appear, and you can use the arrow keys to navigate. Select "Installation – Install Android-x86 to hard disk," then press Enter to select it (**Image D**). Wait while a series of loading messages scrolls by, then leave "Create/Modify partitions" selected, and press Enter again to set up your virtual hard drive.



» Use the right arrow key to select New, then press Enter. Leave Primary highlighted and press Enter again. Leave the size as it is by pressing Enter, then with Bootable highlighted, press Enter again. Finally, use the right arrow key to select Write and press Enter for a fifth time (**Image E**). Type **yes**, press Enter, and wait. Now, select Quit and press Enter.

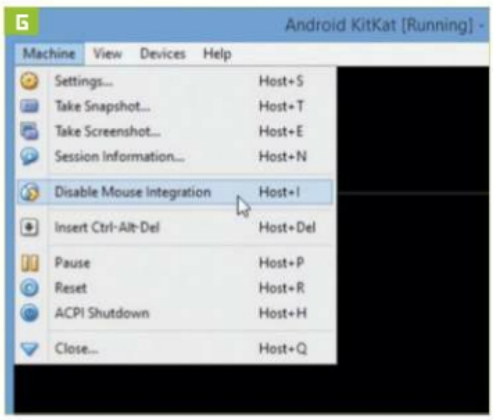


» Leave "sda1" selected and press Enter. Select "ext3" using the arrow keys, and press Enter again (**Image F**). Select Yes and press Enter. Wait for it to be formatted, then select Yes using the arrow keys and press Enter again to install GRUB. Hit Enter again with Yes selected, and Android will be installed on your virtual machine. When it's finished, select Reboot and press Enter.



» When the main screen appears, press Enter and ignore any failed messages. When the welcome screen appears, press the right Ctrl key to give control of the mouse and keyboard back to Windows. Open the Machine menu on the Android window and select "Disable Mouse Integration" (**Image G**), or hold the right Ctrl key and press I. You'll need to do this each time you boot.

All that's left is to set up your new Android virtual device, just as if you were using a new phone or tablet. Click inside the Android window and you'll be able to control it using your mouse. Work your way through the setup wizard, skipping the Wi-Fi option when prompted (Android will use your PC's connection). Sign in to your Google account and you're ready for action.



Play Your Games on Any Computer with Steam In-Home Streaming

YOU'LL NEED THIS

TWO COMPUTERS
In-home streaming works with Windows, OSX, and Linux.

STEAM
Both the host and the client computer must have Steam installed, find them at http://store.steampowered.com.

GAME STREAMING has long been a promise of modern technology, but it's rarely actually been delivered. Where Internet streaming services like OnLive and GaiKai failed, Valve has finally given us a viable streaming alternative in the form of Steam In-Home Streaming, which allows you to stream a game from your gaming PC to any other Windows, Mac, or Linux computer.

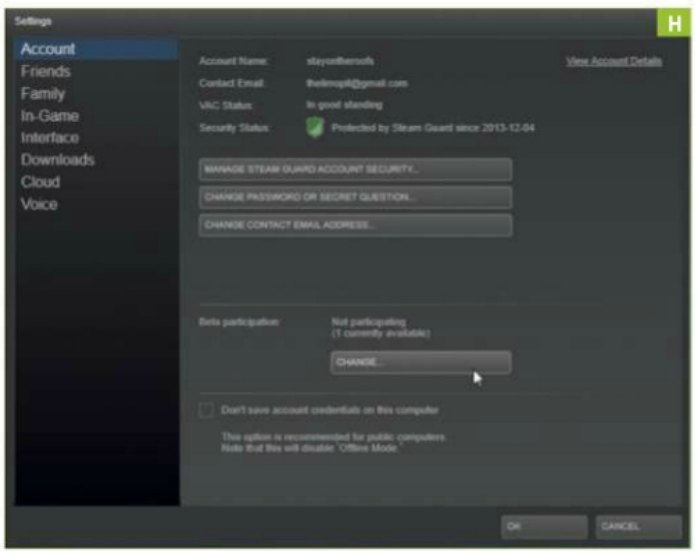
In this guide, we'll show you the nuts and bolts of getting In-Home Streaming set up. The initial stages are really, really easy, but the process can have some problems, so we'll explain how to look at Steam's numerous and often mind-boggling stats and use its diagnostic tools to improve your connectivity and make the most of your hardware.

We've even found a clever method to access your Windows desktop via Steam, although this isn't an official feature of the In-Home Streaming beta. Once you've got it set up, you'll never look back—and you'll finally be able to live the 2007 dream of playing *Crysis* on a netbook.

1 CONFIGURE STEAM At the time of this writing, streaming is only available in Steam's beta. To opt in, fire up Steam on your main computer, click the Steam option at the top of the screen, then choose Settings. Now, choose Change under "Beta participation" (**Image H**).

Use the drop-down menu to opt in to the beta, then click OK. Steam will now restart and update to beta mode. You'll need to repeat this process on the computer you wish to stream games to. Once it's set up, open Steam on the client computer.

Now, select one of the games in your library, and you'll see a Stream option next to Play (**Image I**). Hit this to fire it up on your source computer and play it on the client. Use the drop-down menu to the right of the Play option to install games remotely.



2 TROUBLESHOOT STEAM SETTINGS To get the most out of Steam In-Home Streaming, you'll need to tweak it for your home network. You'll find the option to switch on Steam's streaming analysis tools in the "In-Home Streaming" section of Steam's settings on your client PC. Click "Advanced client options" and check "Display performance information" (**Image J**). The next time you stream a game, you'll see the resolution and frames per second in the lower-left corner. Press the F6 key or an Xbox controller's guide button and Y to switch to a more in-depth chart.

You'll now see a graph at the bottom of the screen (**Image K**), and a lot of statistics. If you're on a wireless connection, try running a game and moving around the house to see how it's affected. Peaks indicate latency, so ideally you want a nice low, flat line across all the different colors. The lines may go off the scale during periods of massive latency, but this doesn't mean your PC is about to explode.

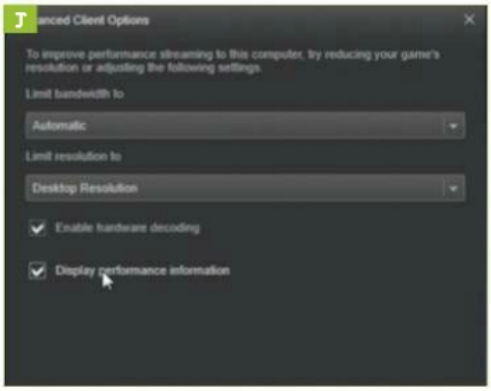
Spikes in the dark-blue line indicate that there's latency at the source computer's end, while peaks in the light-blue line are due to network slowdowns. The red line represents the amount of time it's taking the client computer to decode and draw the current frame. This often ties in with the network line, as the client has to work harder to catch up on dropped frames while keeping things smooth.

Steam constantly records stats while you're streaming. You'll find a text file named streaming_log.txt in the logs folder of your main Steam directory. This has some weird formatting, so you're best off opening it with Wordpad. It can look a little overwhelming at first, but it's easy to understand once you know what you're looking for (**Image L**). You'll see the relevant game's title at the beginning of each section.

Farther down each section you'll see a bunch of stats, including SlowGamePercent, SlowEncodePercent, and SlowNetworkPercent, which will tell you what's causing the largest streaming issues, so look for high percentages here. It's also a good idea to keep an eye on AvgFPS and StdDevFPS to see if altering settings makes a difference.

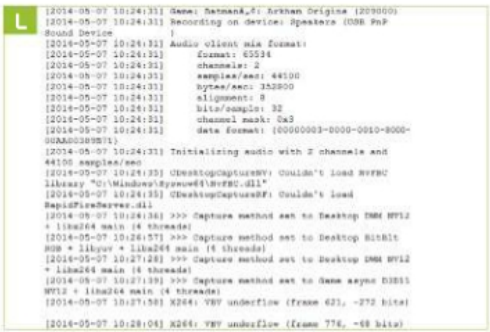
SlowGamePercent and SlowEncodePercent indicate that there's a problem on the host PC, so try dropping the resolution in-game. SlowNetworkPercent suggests that your network is acting up. SlowDecodePercent refers to your client computer; tweak the client options in Steam's In-Home Streaming settings to lighten the load.

J

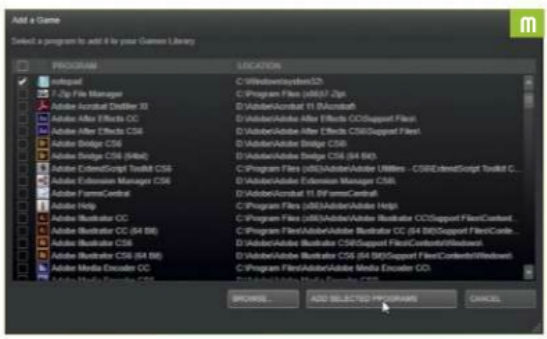

Advanced Client Options
To improve performance streaming to this computer, try reducing your game's resolution or adjusting the following settings.
Limit bandwidth to
Automatic
Limit resolution to
Desktop Resolution
Enable hardware decoding
Display performance information

K

L



M



3 PLAY NON-STEAM GAMES USING IN-HOME STREAMING On your source computer, click Games and then "Add a non-Steam game to my library." Here, you'll find a list of all the software that currently resides on your computer (**Image M**), and you can add almost anything and everything. Use the checkboxes to choose which pieces of software show up in your Steam library. Bear in mind that this is not officially supported, so your results may vary.

You can also stream your source computer's entire desktop via Steam, although it's a bit of an odd workaround. On your source computer, add Notepad as a non-Steam game. You may not see it in your programs, in which case you'll need to browse to it. As it's buried in Windows' system folders, it's easiest to right-click its icon in the Start menu and copy its location from Properties.

Now, stream Notepad to your client PC and bask in the glory of a virtualized instance of Windows' most boring program. Hit the F1 key to bring up Notepad's help. In doing so, you'll summon the Windows desktop. From here, you can run programs, watch movies, and access *Battlefield 4*'s needlessly complicated web-based launcher. You can set this to work from your client computer to your source, too.

Once you've finished what you need to do via the desktop, you may find yourself stuck in the Microsoft equivalent of *Superman II*'s Phantom Zone. To escape, click on Notepad again, then press Alt + F4 to close it. This method works with other programs, too (we chose Notepad because it's the least system-intensive), so try hitting F1 when you're streaming them and see what happens.

BUILD IT

CHRIS ZELE **CONTRIBUTING EDITOR**

A Little Devil's Canyon Rig

We outfit the compact Corsair 250D with Intel's new Core i7-4790K CPU and a dual-rad closed-loop cooler

LENGTH OF TIME: **2–4 HOURS** | LEVEL OF DIFFICULTY: **INTERMEDIATE**

THE MISSION IS SIMPLE: We wanted to take Intel's Devil's Canyon CPU as far as it would go in a compact chassis. For those who don't know what Devil's Canyon is, it's Intel's newest line of Haswell-K CPUs, which are specifically designed to be overclocked. Intel re-engineered the thermal interface material (aka paste) and packaging used in Devil's Canyon to dissipate heat better than last year's Haswell-K CPUs. We should mention Devil's Canyon CPUs are technically only supported by a limited number of 8-series mobos, but will work in all new 9-series boards.

Intel's Haswell CPUs were introduced almost a year ago now, leaving those always on the hunt for the next big thing with nothing to do but twiddle their thumbs. Let the thumb-twiddling cease, at least for the moment, as Intel's new Core i7-4790K aka Devil's Canyon has been hyped as the second coming of the Celeron 300A. With rumors saying the chip would easily hit 5GHz on air, enthusiasts everywhere are expecting this chip to finally get us to that sweet 5GHz overclock mark that hasn't been seen since the days of the original Sandy Bridge CPUs. Was the wait worth it? We grabbed a freshly minted Core i7-4790K to answer the question. Could we get our Core i7-4790K to our desired overclock? Read on to find out!

OVERCLOCKING GOODNESS

WE USED CORSAIR'S 250D case as the frame for our overclocking escapade. The cube-shaped 250D is one of the few SFF boxes compatible with dual-rad closed-loop coolers. We opted for Enermax's Liqtech 240 to cover our cooling needs; it's an impressive cooler and kept our Core i7-4790K at an acceptable 69C under multi-threaded workloads. We then grabbed an ASUS Z97I-PLUS Mini ITX mobo, which sports Intel's newest Z97 chipset, and despite its diminutive size, supports a plethora of overclocking features. For RAM, we decided to go with a pair of 4GB ADATA DDR3/2400 modules. Although RAM clocks haven't made huge differences before, using higher-clocked modules with Haswell does aid performance. The GPU duties were covered by an Nvidia GeForce GTX 780, which is fast, quiet, and runs on the cool side. On the storage front, we opted to use a single Seagate 600-Series 480GB MLC SSD. That's enough space to live on, so the rig's hard-drive population is zero. The box has plenty of room for multiple SSDs and HDDs, though. Finally, we supplied the juice through Corsair's RM 650 PSU, which gives us 650 watts of power and modular cabling.

INGREDIENTS

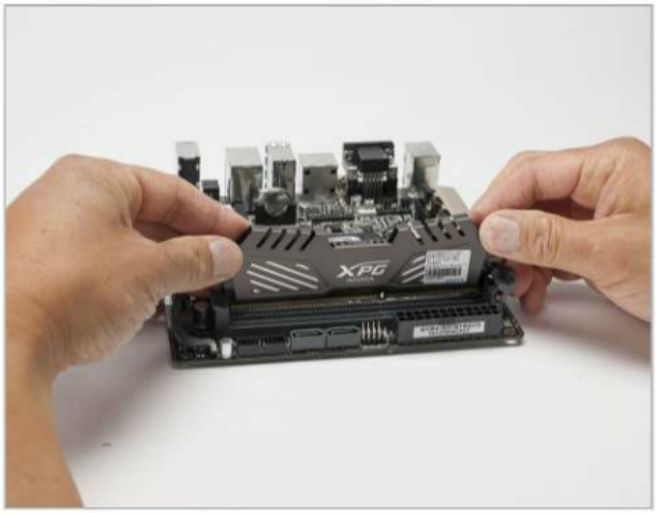
	PART	PRICE
Case	Corsair 250D	$90
CPU	Intel Core i7-4790K	$340
Mobo	ASUS Z97I-PLUS Mini ITX	$160
SSD	Seagate 600 Series 480GB	$350
GPU	EVGA Geforce GTX 780	$520
RAM	8GB ADATA XPG V2 2400MHz	$126
PSU	Corsair RM650	$120
Cooler	Enermax Liqtech 240	$110
OS	Windows 8.1 64-Bit OEM	$100
Total		$1,916

1 TOSS OUT THE ODD BAY

TO GET THE 250D ready for our build, we needed to first remove its ODD bay. To do this, we removed the top panel to expose the case's innards. Next, we unscrewed the ODD from its perch at the top-front—just four small screws, not a problem. From there, you just have to slide the bay toward the rear a tiny bit and lift it out. We're not using an ODD in this build, as there's little use for one in 2014—with a speedy Internet connection and an 8GB flash drive, you can do almost everything that an ODD does. Plus, we needed the space to install the full-size cooler.

2 INSTALL THE CPU AND RAM

THE INSTALLATION of our CPU and memory here is pretty standard stuff. You'll first line up the pins of the processor with appropriate ones on the socket and then clamp it into place. There are two notches cut out of the CPU at the top of the die to help guide you. Line up the CPU's notches with the ones on the socket and then fasten the CPU into place with the mobo-CPU latch. Remember to mind the pins: If you bend the pins on the mobo, you'll kill it. To install the RAM, we unlatched the RAM slots, then lined up the DIMM's notches to fit properly into the RAM slot and pushed down gently but firmly on the module until we heard it click into place.



3 INSTALL THE COOLER'S BLOCK

INSTALLING THE COOLER was similar to most other closed-loop liquid-cooler installations we've done. We first mounted our backplate onto the motherboard with screws and rubber washers. Next, we secured the water block to the CPU by fastening it with four mounting screws. Here's a quick PSA on screw tightening: Always make sure you don't overtighten the water block when installing it, as you could crack your motherboard if you're overzealous about it. We generally recommend tightening the screws in an X-pattern, which should make it easier to mount the block evenly onto the CPU and motherboard. The X-pattern should be used whenever you're installing a heatsink or a closed-loop liquid cooler.

4 INSTALL THE MOBO AND RADIATOR

INSTALLING THE ENERMAX Liqtech 240 was a bit tricky, to say the least. To get things started, remove the 120mm side case fan. The next step is to install the motherboard into the case, using four motherboard screws. Now comes the hard part, you'll have to wedge in the Liqtech 240 cooler at a 45-degree angle. Once the radiator is safely inside the case, secure it with eight mounting screws. The cooler's clearance above the motherboard wound up being less than 1cm, so it's a very tight fit. We don't recommend newbie system builders attempt an installation of the Liqtech 240 inside a SFF case, as it may be too frustrating. We actually threw around a few expletives ourselves during the cooler installation, so it was definitely a challenge.

5 TOSS IN THE GPU

THE GEFORCE GTX 780 slid into the 250D with ease. To get started on the installation, unscrew the thumbscrews that hold the video card bracket into place. Once the bracket is free, slide the video card into the PCIe lane. Once in, you'll need to secure the card in place with its bracket. We like the design of the 250D, as it positions the GPU to exhaust its heat directly out of the chassis. Most cases trap the GPU exhaust heat inside, which can cause thermal issues or disrupt airflow. We should mention that one downside to the 250D is that it only supports two-slot video cards, so if you have a massive three-slot card, it won't fit in this box. Another thing to be aware of is that extra-long video cards won't fit into the 250D, either. According to Corsair's website, the maximum GPU length for a 250D is 11.4 inches.

6 WIRE UP THE SYSTEM

TO INSTALL THE PSU, we removed the PSU backplate of the case by unscrewing two thumb screws. We then slid the unit into place and screwed it in securely. Next, we wired up the motherboard for power and plugged in the case's front-panel connectors. Lastly, we wired up the rest of the motherboard connections for front-panel USB 3.0, audio, and finished up by plugging in our fans. The downside to our 250D is that there's little room for us to hide any of our cabling. In a standard midtower, most of the cabling can easily be routed and concealed. That said, we are impressed with the size of the 250D; we love it's short height of 11.4 inches. And we can't really complain about the cable-routing, but hope that some future SFF cases will offer better routing options.

1. The Enermax Liqtech 240 cooler comes with two 120mm fans and a ton of cooling capacity.

2. This ASUS motherboard measures just 6.7x6.7 inches, and it's packed with some high-end features.

3. Corsair's 250D provides us with a front 140mm fan and (amazingly) will take a good-sized liquid cooler.

4. The GeForce GTX 780 still offers awesome performance while running cool and quiet, and even fits in our case, to boot.

DEVIL'S CANYON BRINGS THE OC HEAT—BUT NOT ENOUGH

FRANKLY, WE WEREN'T VERY BLOWN AWAY with the overclocking performance of the Core i7-4790K. After hearing tales of 5GHz on air using a busted heat sink from a Pentium III, we expected more.

We were able to get the chip stable at 4.7GHz using 1.35 core voltage, but anything beyond that was BSOD heaven. In November 2013 we tested the Falcon Northwest Tiki, which sported an Intel Core i7-4770K overclocked to 4.7GHz, so our 4.7GHz overclock isn't a spectacular accomplishment. Since that was the limit, we backed it down just a notch at 4.6GHz to try to tame the somewhat loud noise the cooling was making.

Our Devil's Canyon box beat out our Zero-Point in a few benchmarks, producing wins in ProShow Producer 5.0 and Stitch.EFX, which it did by an average of 18.5 percent. In multi-threaded workloads such as Premiere Pro and X264 HD 5.01, even the ancient Sandy Bridge-E part with six cores could beat out the Devil's Canyon part.

We also compared our rig to Digital Storm's micro-tower Bolt II, which sports a Core i7-4770K overclocked to 4.5GHz. It was pretty much a tie in the CPU tests, but the Titan Black in the Bolt II trounced our GeForce GTX 780 big time. In 3DMark 11 and *Batman: Arkham City* we took a beating by 25 percent and 54 percent, respectively. We won't even mention the Falcon Tiki Z reviewed this month, with its dual-GPU Titan Z. Of course, our entire build cost about two-thirds what just the GPU in the Tiki Z sells for, so you might want our Devil's Canyon rig, after all!

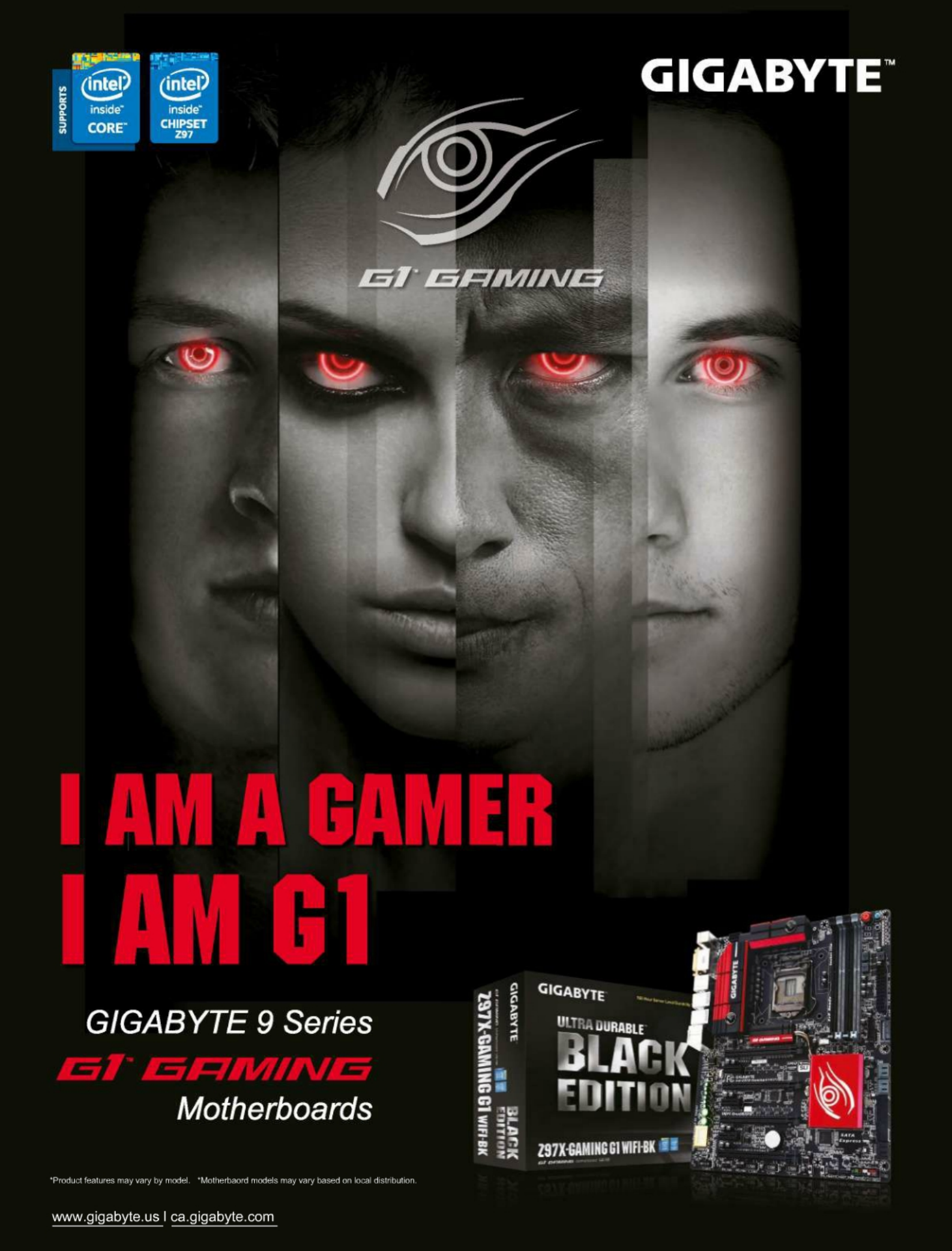
Our goal for this build it was to get a Devil's Canyon part up to 5GHz, but didn't achieve this overclocking feat with our rig. Not that anyone with a Core i7-4770K would likely be considering an upgrade, but news flash: Don't bother. If you've held onto an Ivy Bridge or Sandy Bridge part for the past few years, and you're looking for good time, Devil's Canyon is a good fit for you. The Core i7-4790K currently has the highest base and turbo boost clock speeds of any i7 desktop part, and it costs the same as a Core i7-4770K, so new builders should rejoice.

BENCHMARKS

	ZERO-POINT	
Premiere Pro CS6 (sec)	2,000	2,230 (-10%)
Stitch.Efx 2.0 (sec)	831	702
ProShow Producer 5.0 (sec)	1,446	1,212
x264 HD 5.0 (fps)	21.1	19.9 (-6%)
Batman: Arkham City (fps)	76	70 (-8%)
3DMark11	5,847	4,437 (-24%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our current desktop test bed consists of a hexa-core 3.2GHz Core i7-3930K 3.8GHz, 8GB of Corsair DDR3/1600, on an Asus Sabertooth X79 motherboard, with a GeForce GTX 690, an OCZ Vertex 3 SSD, and 64-bit Windows 7 Professional.


SUPPORTS
intel inside CORE
intel inside CHIPSET Z97
GIGABYTE™
G1 GAMING
I AM A GAMER
I AM G1
GIGABYTE 9 Series
G1 GAMING
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*Product features may vary by model. *Motherbaord models may vary based on local distribution.
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REVIEWS

TESTED. REVIEWED. VERDICTIZED.

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FALCON TIKI Z PAGE 76

Falcon Northwest Tiki Z

SLI performance in a micro-tower, at last!

The Tiki Z's clever use of space includes attaching its liquid cooler to the side panel.

IF YOU WANT PROOF that micro-towers are getting to the point where they can threaten full-tilt-boogie gaming rigs, it's right here in front of your face with Falcon Northwest's Tiki Z.

How else could you explain the moment of concern—short though it was—that a micro-tower could actually show up this year's $30,000 Dream Machine? The Tiki Z is no mere micro-tower, of course. Inside its 4-inch chassis, Falcon Northwest manages to magically insert the most misunderstood card of late: the GeForce GTX Titan Z. Most wondered why Nvidia would even make such a card.

Well, here's one reason: You can fit it in a micro-tower, and that certainly can't be said of AMD's Radeon R9 295 X2. What the Titan Z does for its insane pricing is give micro-towers the one thing they've been lacking: dual-card-like performance.

Falcon did have to make some adjustments to get the Titan Z in there. There's clever venting through the Nvidia symbol and sealed exhausts to keep the Titan Z from heating up the machine. Falcon also had to up the PSU to a new Silverstone 600-watt unit. The "rest" of the machine is a liquid-cooled Devil's Canyon Core i7-4790K with an overclock of 4.4GHz on all cores and 4.7GHz on two cores. Also new to the Tiki is a base that's cut from a billet of aluminum instead of the typical granite look the Tiki has sported the last two years. We like the change as it allows Falcon to paint it and frankly, the granite look didn't work for all of us.

The paint itself is spectacular. Dare we say, one of the best paint jobs we've ever seen in a PC? We say this because Falcon made it a point to mention that our comment about Digital Storm's Bolt II paint being the "best we'd seen" isn't actually custom paint since it's a ceramic coating. We'd point that a Cerakote is still technically paint, but we'd agree the Tiki's paint is exceptional and flawless. We won't say the best paint ever because if we did, next month there'd be another vendor out to prove us wrong.

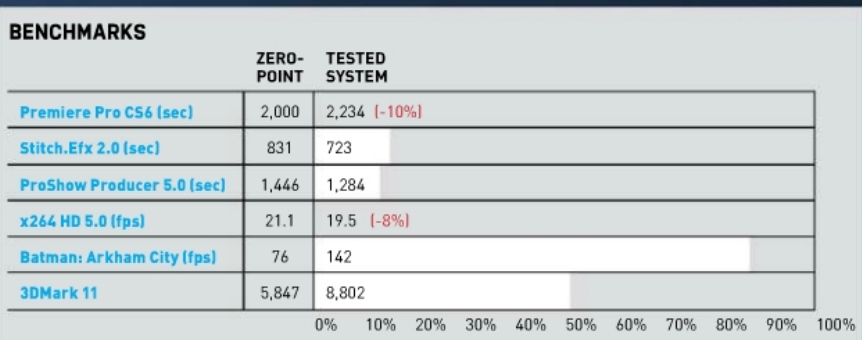
None of this matters without performance though, and the Tiki Z has that it spades. Except for the multi-threaded tests, it outpaces our zero-point system with its dual-GPU GeForce GTX 690. But what about Digital Storm's Bolt II from our June 2014 ish? There it's a closer battle. The Tiki Z's Devil's Canyon CPU is clocked down a percent or three against the Bolt II, which has a much larger CPU cooler (and the chassis is also significantly bigger, too) and it suffers in the CPU benchmarks.

The dividends of the dual Titan Z show up in 3DMark 11, where the Tiki Z demolishes the Titan Black in the Bolt II by almost 50 percent. We'll also note that we think we blew our *Batman: Arkham City* run for the Bolt II, as there's no way a single Titan Black would be faster than a Titan Z.

In the end, we'd have to say that the Tiki Z sets a new bar for the gaming performance to be expected from a micro-tower. It slips a bit in raw CPU performance but not enough to matter. If you're looking for the ultimate compact gaming PC, you'll have a hard time finding one faster—or more expensive—than the Tiki Z.

-GORDON MAH UNG

BENCHMARKS



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VERDICT **9**

Falcon Northwest Tiki Z

+ THE WILD BUNCH Spectacular gaming performance in a compact package.

- BRADY BUNCH Wildly expensive; still no way to run horizontally.

$7,563, www.falcon-nw.com

SPECIFICATIONS

Processor	Liquid-cooled Core i7-4790K@4.4-4.7GHz
Mobo	Asus Z97-I Plus
RAM	8GB DDR3/1866
GPU	EVGA GeForce GTX Titan Z
Storage	2x 1TB Crucial M550 SSD in RAID 0, 4TB Western Digital HDD
Optical	Panasonic UJ-265
Case / PSU	Custom / Silverstone SX600-G

Stellar battery life marred by a mediocre screen.

Toshiba Chromebook 13

The world's first 13-inch Chromebook!

TOSHIBA HAS A unique way to market the Chromebook 13. As its name implies, it's the "first" 13-inch Chromebook. That doesn't actually mean it's the biggest, though—HP's 14-incher takes that prize. But when you're the latest PC maker to jump aboard the Chrome OS train, you gotta do what you can to stand out.

In looks, the Chromebook 13 certainly does stand out. It's stylistically reminiscent of wedge-shaped laptops such as the Asus Zenbook or the Macbook Air, but that's only skin deep. While those pricier notebooks feature aluminum skins, the Chromebook 13 is painted plastic. Internally, however, the notebook isn't too different than the better Chromebooks we've tested. It packs a dual-core 1.4GHz Celeron 2955U Haswell part without Hyper-Threading or Turbo Boost.

For context, we compared the Chromebook 13 to HP's Chromebook 11, which uses a Samsung Exynos ARM chip, and the Acer C720, which has the same Celeron part as the Chromebook 13. Generally, the Chromebook 13 tracked right with the Acer. It was perhaps a percentage point or three slower, but the two were mostly even. The Exynos was half the speed or worse, in general. Frankly, we'd avoid ARM-based Chromebooks, as they chug when you push them too hard. One thing we'll note: The Acer C720 we used has 4GB of RAM vs. the 2GB in the Chromebook 13. That gave it an advantage when we had 20 tabs open in the browser. It wasn't huge, but power browsers should shell out for 4GB configs. The ARM-based HP, well, was simply atrocious.

The screen is obviously a big part of the sales pitch. If an 11.6-inch Chromebook screen is too small and a 14-inch screen is too big—13 is just right, right? Unfortunately, that 13-inch panel is pretty mediocre. Colors are muted, off-axis is meh, and worst of all, the screen shows considerable compression banding. In fact, we'd swear the screen was running 16-bit color depth instead of 24-bit depth because the banding is so uniform and pronounced.

For ports, you get a decent amount for a Chromebook, with two USB 3.0 ports, an SD card reader, and a mic-and-headphone combo port. For the security-minded, there's also a Kensington lock port, but as you know, if some lowlife swipes your Chromebook, you lose nothing.

The island-style keyboard is just average, as well. We should note that the H key on our review sample broke loose, but we think it's just a defect with our particular machine. The track pad is spacious, but we didn't appreciate its rough texture, and it had an annoying loose rattle to it. The speakers also rattled a bit when audio was cranked up to maximum.

There is some good news for the Chromebook 13, though: its USB 3.0 performance. The Chromebook 13 could write a 4GB video file to local storage in 78 seconds. The Acer took 136 seconds, and the HP, which lacks USB 3.0, took an agonizing 359 seconds.

The final feather in the Chromebook 13's cap is its battery performance. We looped the FutureMark Peacekeeper test to run our units down. The HP Chromebook 11 is pretty fair at 335 minutes of run time. The Acer C720's gives you an additional 106 minutes of use. And, the Toshiba lets you keep things running for another 20 minutes over even the C720. Since the test is CPU-intensive and keeps the Wi-Fi hot, you should expect probably another 20 to 30 percent of run time on more typical loads.

Overall, the Toshiba is a nice first attempt but it's got some issues. Although most won't notice, we think the banding problem needs to be addressed. At 3.3 pounds, the Chromebook is also a little heavy. The HP Chromebook 11, for example, is almost a pound lighter. While that weight gets you a bigger screen, it doesn't buy you any actual window real estate, as the resolution is the same 1366x768 as the 11.6-inch models. It's just a bigger font.

Finally, there's the price. At $269 on the street, it's certainly not the cheapest Chromebook out there. This, combined with the other issues, still keeps the homely Acer C720 as our pick. –GORDON MAH UNG

VERDICT **6**

Toshiba Chromebook 13

+ CHROME Good battery life; fast USB 3.0 performance.

– CHROMED PLASTIC Mediocre screen; slightly pricey; mushy keyboard.

$269, www.toshiba.com

BENCHMARKS

	Toshiba Chromebook 13	Acer C720	HP Chromebook 11
FutureMark Peacekeeper	2,854	**2,897**	1,175
Google Octane V2	10,844	**11,144**	5,756
SunnSpider 1.02	319.2	**222.2**	677.9
BrowserMark 2.0	3,259	**3,340**	1,551
Kraken 1.1	2,593.5	**2,567.9**	5,135.8
Wirple	1,057	**1,137**	227
RoboHornet Alpha	**99.46**	94.93	52.49
USB 3.0 4GB File Copy (sec)	**78**	136	359
Battery Run Down (min)	**461**	335	441

Best scores are bolded

SPECIFICATIONS

CPU	1.4GHz Celeron 2955U
RAM	2GB DDR3
Storage	16GB
Connectivity	802.11n, Bluetooth 4.0
Dimensions H x W x D	0.8 x 12.9 x 8.9 inches
Screen	13.3-inch TN, 1366x768
Weight	3.3 lbs.
Ports	HDMI, two USB 3.0, analog audio in/out, SD reader, Kensington lock port
Camera	720p front-facing

OCZ RevoDrive 350

Screaming SSD punishes benchmarks—and wallets

Despite being a RAID device, this RevoDrive can still accept trim commands.

THE WORLD OF solid-state drives has reached a state of limbo. We're pretty much at the limit of current SATA technology, and SATA Express will be more of an evolution than a revolution. If you really need some extra horsepower, where do you turn? The new M.2 slot promises up to 40 percent faster speeds than SATA, but we haven't seen anywhere near that yet. They're on the right track though, since the PCI Express bus they use has a lot of spare bandwidth, if it's not fully occupied with a video card. OCZ has known this for some time, as its new RevoDrive 350 is the latest entry to a long-running line of PCIe-based SSDs. OCZ's new drive offers speeds of up to 1,800MB/s, which is three to four times faster than a SATA-based SSD.

How is that possible? OCZ is running four devices in RAID 0 to achieve the 480GB capacity and the blistering speed. There are also 240GB and 960GB versions of this drive, but interestingly, the 240GB version's speed is cut in half since it uses two controllers rather than the four Sandforce SF-2282 drives that the 480GB version uses. For NAND fetishists (and you know who you are), its 19nm MLC flash is rated to let you write 50GB a day for three years.

All this hardware doesn't come cheap—the RevoDrive 350 sports a whopping $830 price tag. Since a standard 480GB SATA-based SSD is about a quarter of that, we have to figure out what kind of user might benefit the most from this drive.

Like conventional SSDs, it's not 1.8GB/s across the board. That's just for sequential reads and writes of large files; real-world usage is a mix of files from the gigabytes to the kilobytes. When it comes to files up to 32KB in size, the RevoDrive won't outstrip SATA speeds. It's not until you hit 64KB that performance bests a SATA-based SSD. But since it hits 1.8GB/s at the 4GB file size, it's an indisputably superior choice for things such as HD video production or even batch processing of high-resolution photography. Someone who just wants a nice SSD to boot Windows and load some games quickly will see negligible benefits.

The installation experience is much cleaner than a SATA drive, though. The RevoDrive does not need cables for power and data—all that goes through the PCIe slot on the motherboard. So you just put it in, screw down the bracket, and turn on the computer. You will need to install drivers included on a CD, though, whereas a SATA drive is recognized right away. The RevoDrive's lack of immediate recognition creates a hurdle if this is the primary drive of a freshly built PC, but Windows lets you add drivers during the OS installation process. You may also have to do some fiddling in the BIOS to get the Windows installer to see the drive properly, so the RevoDrive isn't positioned well for someone who's new to building PCs (in case the price tag didn't already tip you off). Also, the secondary PCI Express slots on non-enthusiast motherboards usually max out at x4 PCIe 2.0, while this unit needs x8 to reach its advertised numbers.

We got some interesting benchmark results when we compared the numbers from our Z77-based Gigabyte motherboard to that of a system with an X79-based Asus Rampage IV Extreme. The RevoDrive generally performed much better with the X79 chipset, though the gap closed for our HD video encoding test. This kind of variance is not unusual for PCIe-based SSDs. The Plextor M6e that we reviewed in our June 2014 issue also performed better on X79. To us, it seems like another reason to limit a PCIe storage device to specific roles. Hopefully, the upcoming NVM Express–based drives will be more consistent across different scenarios. **-TOM MCNAMARA**

VERDICT **8**

OCZ RevoDrive 350

U-BOAT Warp drive velocity; easy installation.

ROW BOAT Very high price tag; variable performance.

$830, www.ocz.com

BENCHMARKS

	OCZ RevoDrive 350 (Z77)	OCZ RevoDrive 350 (X79)	Plextor M6e	Intel 730 Series	Samsung 840 Pro
Controller	SandForce SF-2282	SandForce SF-2282	Marvell 88SS91183	Intel 3rd Gen.	MDX
Capacity	480GB	480GB	256GB	480GB	512GB
CrystalDiskMark					
Avg. Sustained Read (MB/s)	1,016	**1,215**	759	468	534
Avg. Sustained Write (MB/s)	627	**689**	575	491	514
AS SSD - Compressed Data					
Avg. Sustained Read (MB/s)	1,122	**1,603**	695	515	513
Avg. Sustained Write (MB/s)	683	**867**	548	471	495
ATTO					
64KB File Read (MB/s)	749	**889**	729	373	524
64KB File Write (MB/s, 4QD)	531	**640**	487	468	497
Iometer					
4KB Random Write 32QD (IOPS)	75,845	67,686	64,676	**78,242**	82,297
PCMark Vantage x64	37,680	39,078	52,387	49,969	**75,205**
Sony Vegas Pro 9 Write (sec)	269	266	**263**	442	294

Best scores are bolded. Except where otherwise noted, all tests are conducted on our hard drive test bench, which consists of a Gigabyte Z77X-UP4 motherboard, Intel Core i5-3470 3.2GHz CPU, 8GB of RAM, Intel 520 Series SSD, and a Cooler Master 450W power supply.

Microsoft Surface Pro 3

A hybrid we'd take everywhere

The Surface Pro 3's Type Cover boasts a much improved trackpad over the Surface Pro 2's.

WHEN THE ORIGINAL Surface Pro launched, no one quite knew how to classify the hybrid. Was it a tablet that was trying to be a laptop? A laptop trying to be a tablet?

Well, call us contrarians: We're going to come right out and say the Surface Pro line is neither and doesn't need to be—particularly in the case of the Surface Pro 3, which combines the best of both worlds.

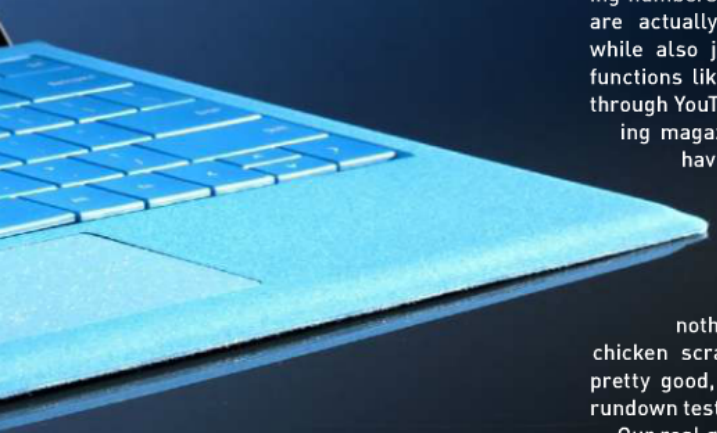
At just 1.76lbs (2.42lbs with the optional Type Cover attached) and 0.36-inches thick, it's one of the lightest and slimmest x86 ultraportables we've gotten our hands on yet. When thrown into a backpack or shoulder bag, the Surface Pro 3's barely noticeable, even when on you're on your feet all day. And given its generous size—the SP3 has a 12.1-inch, 2160x1440 IPS screen—it's a bit of a marvel that its internals include a Core i5-4300U CPU, 8GB of DDR3 RAM, and a 256GB mSATA SSD. And unlike its first-generation predecessor, the Surface Pro 3 runs cool and, for the most part, very quiet. Even when the fan starts running under load, it's still more of a hum than the turbo-engine whirling you'd hear in an SP1.

Of course, there are trade-offs for cramming so much into so little space, with the additional requirement of being cool and quiet. While it performed slightly better than our zero-point (the original Surface Pro), during intensive loads we saw a decrease in performance. We suspect this is due to the system favoring thermals over performance—a way of still improving on SP1's well-deserved reputation for running unabashedly loud and hot when pushed. Don't expect to play triple-A titles on the SP3—or even farm league games; we barely cracked 16fps in *Batman: Arkham Origins*' benchmark. It did run the Little League–level *Super Meat Boy* at 50 fps and *Limbo* at 29.4 fps, so there is some fun. Heavily threaded loads also are best left to a beefier systems, as our ProShow 5 benchmark (which is limited to four threads) took almost an hour to complete.

But as a hybrid, the Surface Pro 3's hard to beat. With its multi-point kickstand, you can adapt it to a wide variety of scenarios (like drawing, lying stretched out, sitting in a car)—particularly when combined with the updated Type Cover, which sports a magnetic strip that clings to the bottom edge of the SP3 to provide additional stability. We liked being able to do actual work—between its ample screen real estate and 3:2 aspect ratio, doing daily tasks like writing articles, crunching numbers, and creating presentations are actually comfortable on the go—while also jumping to more tablet-like functions like watching Netflix, trawling through YouTube for cat videos, and reading magazines through Zinio (without having to zoom to read tiny text, to boot). Taking notes by hand via OneNote on the touchscreen is as good as in previous models, though sadly, nothing will ever counteract our chicken scrawl. And its battery life is pretty good, lasting 242 minutes in our rundown test.

Our real quibble with this machine has not to do with its hybrid status, but with its accessories. Though the Type Cover's trackpad is vastly improved over the SP2's version, it can be a bit hypersensitive. It's also surprising that the Type Cover is still as expensive as it is; its street price is 10 percent of the cost of our review unit. We're also not huge fans of the pen loop that holds the stylus, as we're pretty sure we'll lose the instrument due to the loop tearing or losing its adhesive stickiness in about a month.

Still, these are entirely minor complaints, and we're still more than happy to deal with them as part of being able to trade a few devices in our bag for just one. Haters are going to kvetch about how it's not what they'd spend their money on, but if you've been an ultraportable fanatic well before Intel began its Ultrabook push, you'll love just how much hardware is in this svelte form. **–ALAINA YEE**



BENCHMARKS

	ZERO-POINT	
Stitch.Efx 2.0 (sec)	1,035	795
ProShow Producer 5.0 (sec)	2,760	2,952 (-7%)
Battery Life	153	242
3DMark Ice Storm	37,762	38,612
3DMark Cloud Gate	3,405	4,487
Batman: Arkham Origin (fps)	21	16 (-24%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our zero point hybrid is a Surface Pro with an Intel 1.7GHz Core i5-3317U, 4GB DDR3/1600, 128GB mSATA SSD, Intel HD 4000, and Windows 8.1 Pro 64-bit. *Batman: Arkham Origins* tested at 1024x766.

VERDICT **9**

Microsoft Surface Pro 3

+ FEATHERWEIGHT Thin and light; multi-point kickstand; runs cool and quiet.

– FEATHERBRAINED Twitchy touchpad on Type Cover; pen loop accessory is flimsy.

$1,300 plus $130 Type Cover
www.microsoft.com

SPECIFICATIONS

CPU	1.9GHz Intel Core i5-4300U
RAM	8GB DDR3/1600
GPU	Intel HD 4400
Display	12.1-inch, 2160x1440 IPS display (glass)
Storage	256GB mSATA SSD
Connectivity	Mini DisplayPort, microSD card reader, USB 3.0, headphone input, 5MP front and rear webcams, Bluetooth 4.0, 802.11ac, 802.11 a/b/g/n
Lap / Carry	2 lbs, 6.7 oz / 2 lbs, 13.7 oz

The new Find My Laptop feature can save your bacon if your laptop gets lost or stolen.

ZoneAlarm 2015 Extreme Security

AS FAR AS WE CAN TELL, Check Point is still using Kaspersky's antivirus engine to drive its ZoneAlarm security products, including ZoneAlarm 2015 Extreme Security, the top-of-the-line security suite in Check Point's stable. Paired with the popular two-way ZoneAlarm firewall, Check Point is able to offer end users a nearly impenetrable perimeter of protection against various forms of malware.

In our tests, ZA swatted away foul files like the nuisances they are, though like Kaspersky Internet Security 2014 (reviewed in July 2014 issue), ZA casually waits for dirty downloads to reach the desktop before zapping the nasty code. Nervous Nelsons might prefer that downloads be blocked from the source, though to ZA's credit, it didn't let any of the malicious downloads harm our testbed.

There's a lot more that Check Point cobbled together for its Extreme package, including a few new editions for the 2015 release (don't let the year fool you, the 2015 version is available now and has been for several months). A new Threat Emulation tool opens email attachments and web downloads in a virtual sandbox in the cloud to minimize the fallout of zero-day malware, and a Find My Laptop feature helps locate lost or stolen laptops on a map via Wi-Fi-enabled location tracking. It also allows you to lock down your notebook, send a message to the finder (or thief), take a webcam picture, grab a screen capture, and retrieve and back up your files remotely. If you're worried about losing your notebook, this negates the need to invest in third-party laptop-recovery software.

Threat Emulation and Find My Laptop are exclusive to the Extreme package, and so is a PC tune-up function that's supposed to speed up your PC through a four-stage process that primarily focuses on your system registry. These types of utilities make us uneasy because of the potential to do harm by mucking around in the registry. That said, ZA didn't mess up anything after running a tune-up, but we also didn't notice a speed improvement, even after correcting supposedly numerous errors.

If these three features don't appeal to you, ZA Internet Security 2015 offers the same protection for $10 less. We don't think the premium is worth it for the tune-up function, though the combination of Threat Emulation and Find My Laptop easily adds $10 worth of value.

Bouncing around ZA's interface is fairly easy, once you've spent a few minutes poking around. It's not as slick as some of the other AV UIs we've seen, nor is it heavy on deep-level customizations, but it's at least serviceable. If you somehow get lost, a quick click (or tap) of the home button in the upper-left corner will return you to the main menu. From there, you can select from five different hyperlinks on the top—Scan, Update, Tune-Up, Tools, and Help—as well as view more details for three main tiles consisting of Antivirus and Firewall, Web and Privacy, and Mobility and Data.

Curiously missing from ZA's top-end offering is mobile protection for smartphones and tablets. Many of the big names in AV are now including multi-device protection for PC and Android. It's also missing amenities like a file shredder or virtual keyboard, though you do get features like parental controls and ID theft protection with daily credit report monitoring. **–PAUL LILLY**

VERDICT **8**

ZoneAlarm 2015 Extreme Security

PB & J Superb protection against malware; tracks down lost or stolen laptops; excellent two-way firewall.

EGGS & KETCHUP No mobile device protection; PC tune-up tool seems gimmicky; impacts system performance slightly more than some other AV suites..

$90 (1 Year, 3 PCs), www.zonealarm.com

BENCHMARKS

	Scan 1	Scan 2	Peacekeeper	Boot	3GB File Transfer	Verdict
ZoneAlarm	23min 17sec	3min 43sec	2141	+4.5sec	+0.5sec	8
BitDefender	3min 42sec	46sec	2199	+3sec	+0sec	9/KickAss
Kaspersky	9min	1min 1sec	2199	+2sec	+0sec	8
Norton	6min 40sec	2min 15sec	2206	+0sec	+0sec	9/KickAss
McAfee	9min 45sec	6min 40sec	2218	+2sec	+0sec	8
Webroot	42sec	15sec	2162	+3sec	+0sec	9
ESET	3min 48sec	26sec	2214	+1.5sec	+1sec	9
Avira Free	7min 53sec	7min 48sec	2210	+1sec	+1sec	8
Avast	6min 20sec	5min 9sec	2210	+2sec	+1sec	8

Our test machine has an Intel 2.8GHz Core i7-930, Asus P6X58D Premium, 4GB Corsair DDR3/1333, Radeon HD 5850, 120GB Kingston SSDNow V300 (OS), Western Digital Red 3TB 7,200rpm (storage), and Windows 8.1 enterprise. ZoneAlarm was compared against this year's top-performing AV programs with a score of 8 or higher.

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The TrackIR 5 helps you keep your eye on the prize.

NaturalPoint TrackIR 5

Keeping track of gaming immersion since 2009

WE'LL ADMIT, Natural Point's TrackIR 5 Pro is nothing new. That's because it's been around since 2009, when our Mr. Carey (now of *Sir, You Are Being Hunted* fame) reviewed this "latest" iteration of the head-tracking sensor. It's a testament to the quality of the TrackIR that now, five years later, it's still a genuinely game-changing peripheral. Its only problem is that the price hasn't dropped since then.

The Oculus Rift is praised for delivering immersive gaming, but the TrackIR has been quietly putting you further into the game for years. In fact, the latest Oculus Rift (DK2) has just added a similar positional-tracking system to its own arsenal. You could say that the TrackIR is almost the poor man's Rift in terms of immersion, but that would be doing a disservice to the work NaturalPoint has put into it, as well as redefining the term "poor man."

The TrackIR works with a high-speed infrared camera sitting atop your monitor, tracking the relative position of your head. It does this using either a set of reflectors on the standard, hat-mounted TrackClip, or the USB-powered LEDs of the headset-mounted TrackClip Pro. It has six degrees of freedom, tracking a full range of movement of your noggin. It's the way that's translated into your games that is the smart part, though.

You're still looking at a fixed viewpoint—your monitor—but as the TrackIR precisely follows the movement of your head, it also amplifies it in-game. That means a slight turn of your head will move the game camera much further on screen. That might sound unwieldy, but the accuracy and consistency of the TrackIR makes it all incredibly intuitive, and it doesn't take long before you're naturally tracking things in your chosen game world.

It doesn't work for all games, but in the ones that it does you'll wonder what you ever did without it. We can barely imagine playing *Elite: Dangerous* without being able to track targets around our cockpit, and in Bohemia's *Arma* series and *DayZ*, the extra awareness of your situation is a major advantage.

The tough bit, as we mentioned earlier, is that some five years down the line, the Pro package is still the same price it was at launch. This is the package you want though, as it comes with the LED TrackClip Pro and means you don't need to wear a fashion faux-pas baseball cap to support the reflective TrackClip. It's a lot of money for a gaming gadget, but unlike others, the TrackIR is genuinely useful. It's also half the price of an Oculus Rift, and has the benefit of letting you still see your controllers, take a drink when you want, and use the beautiful high-res monitor you paid good money for. You won't get the same level of immersion, but you will definitely get a big step up in the games it supports.

The TrackIR is definitely one for the sim-heads rather than the *BF4* crew, but in racing games, flight sims, space sims, and serious military shooters, it's pretty much a must-have peripheral. You might call head-tracking a gimmick, but only until you actually use it in-game. **–DAVE JAMES**

VERDICT 8

NaturalPoint TrackIR 5 Pro

TRACK MEET Seriously ups immersion; easy to use.

TRACK FEET Pricey peripheral.

$185, www.naturalpoint.com

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HELLO, 4K LCD!
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The city is beautifully rendered but we wish it were more interactive.

Watch_Dogs

A Script Kiddie in a Hacker's World

MINUS THREE POINTS for Ubisoft's *Watch_Dogs* due to the game's developers slapping an underscore right in the middle of its name, much to the annoyance of magazine editors worldwide. Minus two more points for Ubisoft's online service, Uplay, being a complete pain to work with. Finally, minus all the points for *Watch Dogs* (insert your own underscore if you like, we're done with it) being a bit of a letdown, squelching the high hopes we'd carried for this seemingly innovative title ever since its big reveal at E3 in 2012.

In this open-world title, your character, Aiden Pearce, is a hacker. His cell phone is his version of The Force. By tapping just a few buttons, Pearce can hack into a whole ton of interesting things within the game's version of Chicago. The setting is a beautifully crafted recreation of the Windy City where everything electronic is tied into a single, universal digital manager: ctOS (the "Central Operating System").

The phrase "hacking" might make you think of a game like *Hacker: Evolution*. Allow us to pop that bubble prematurely; hacking, in this case, is a one-button affair. The game highlights things that your UberPhone can affect when you're near them—like a traffic light, one of Chicago's many bridges, or one of the billion surveillance cameras scattered around the city, to name a few—and you tap (or hold) a key on the keyboard to make the magic happen. No code. No *Matrix*-like world-shifting. It's that easy.

This simplicity ties into the game's action sequences a little too well, we feel. *Watch Dogs* has the usual escalation setup whereby successive evil things you do raise your police wanted level. For whatever reason, Ubisoft elected to not give Aiden the ability to fire guns out of the cars—even though he gets an arsenal to pick from on foot in a game that promotes stealthy hacks over gunfights. You're at the mercy of your cell phone when it comes to fleeing the very-persistent law (that, and awkward vehicle handling).

That's actually not as bad as it sounds, as *Watch Dogs* provides you with a bit of a cheat—an audible clue for whenever one of the many disruptions you can trigger around the city would otherwise keep the police (or whoever) from chasing you. For example: Drive past a traffic light, wait for the noise, hit the button, and you're good to go (assuming there aren't more cars picking up the pursuit, as using these hacking tricks further raises your wanted level).

And there are always the fun gaming exploits. Since the good guys don't have aquatic vehicles, swimming out into water (or stealing a boat) is the tried-and-true method of escape. The police, in turn, often launch a ctOS scan to find you whenever you've initially fled them. While the concept

Cars don't move out of the way when you're driving an emergency vehicle. Come on, Ubisoft.
Remote profiling triggered
CRIME DETECTED
X Place waypoint
POLICE

fits the game, it's a bit annoying that all you have to do to avoid retriggering the pursuit is to avoid the moving scanning zones on your mini-map, pull into a parking garage, and hack the door shut (highly effective at making the stupid AI forget where you went), or use a "Jam Communications" device that you can craft. When the game isn't being annoying with said scans, it's being dumb in letting you escape the befuddled AI.

While *Watch Dogs* is full of plenty of minigames and other tidbits, there's not a lot that we feel like we *want* to do within the game. Chess? No. Shell game? Nope. Check into virtual places via an in-game Foursquare-like setup? This has to be the most worthless feature we've ever seen in an open-world title. The last thing we want to do is spend hours traipsing around the city to become a mayor of a virtual location, especially when there is absolutely no benefit to doing so—a feature that could have been a great linchpin of an in-game economic system but, as it stands, is mostly for achievement junkies.

The "profiling" system that gives you an instant dossier about Chicago's inhabitants is fun for the first few moments, until you start to realize that these details are randomly generated. This lack of uniqueness, including the randomized phone calls you can eavesdrop on, take from the feature's gravitas. That, and the NPCs are really only useful for obtaining more cash via quickly "hacking" their bank accounts or going on one of a few simple side missions—we want more like, say, the ability to hack into a person's apartment to upgrade one's computing capabilities, or to find the location of a huge weapons stash, or possibly some city-changing elements or two (hack the mayor, anyone?)

We feel as if *Watch Dogs* can't decide if it wants you to be a thief or a soldier. The game's main campaign missions are obviously designed from a stealth/hacking front, yet hacking doesn't work very well during its combat-centric parts. Sure, you can make lifts go up and down (Aiden can't jump, to note), or you can distract guards to sneak your way over to places. The mechanics eventually get old. Wait for a guard to walk near something explodable; explode it. Use cameras to find a guard holding a grenade; detonate it on his behalf. Pull out a silenced pistol and headshot all other guards so as to not trigger alarms. Yawn.

Even though you get fun little one-off items for luring guards to particular places or, if you're quite dastardly, blacking out the entire district you're in, we still feel as if a lot more creativity could have been injected into the game's primary hacking mechanic. For your powers, you should have 100 options to choose from at any given moment, not three. And the combat itself makes us laugh; it's far too easy to kill enemy NPCs, save for when they're ganging up on you and flanking *en masse*. Even without *Watch Dog*'s *Max Payne*–like bullet mode, it's a joke; flip that on, and you're nigh-unstoppable with a decent weapon.

We realized the game was in for trouble when we discovered that it was faster and easier to just headshot everyone instead of finding "hacky" ways of getting around combat. Who needs steam pipes when you have a sniper rifle?

Watch Dog's other major "hacking" mode involves you solving "fluid through the tubes" puzzles to gain access to key databases. It's good to see we're still relying on the *BioShock* mechanic in a technology-centric hacking game. Was that really the best idea you had, Ubisoft?

Watch Dog's fascinating multiplayer concepts could have been a big saving grace. We'd love to have been able to check out its "another hacker invaded your game and you have to take them out" mode, but Ubisoft's Uplay service refused to connect us, citing NAT issues with our simple router setup that's never given us grief for any other multiplayer service. Talk about leaving us "hacked" off. –DAVID MURPHY

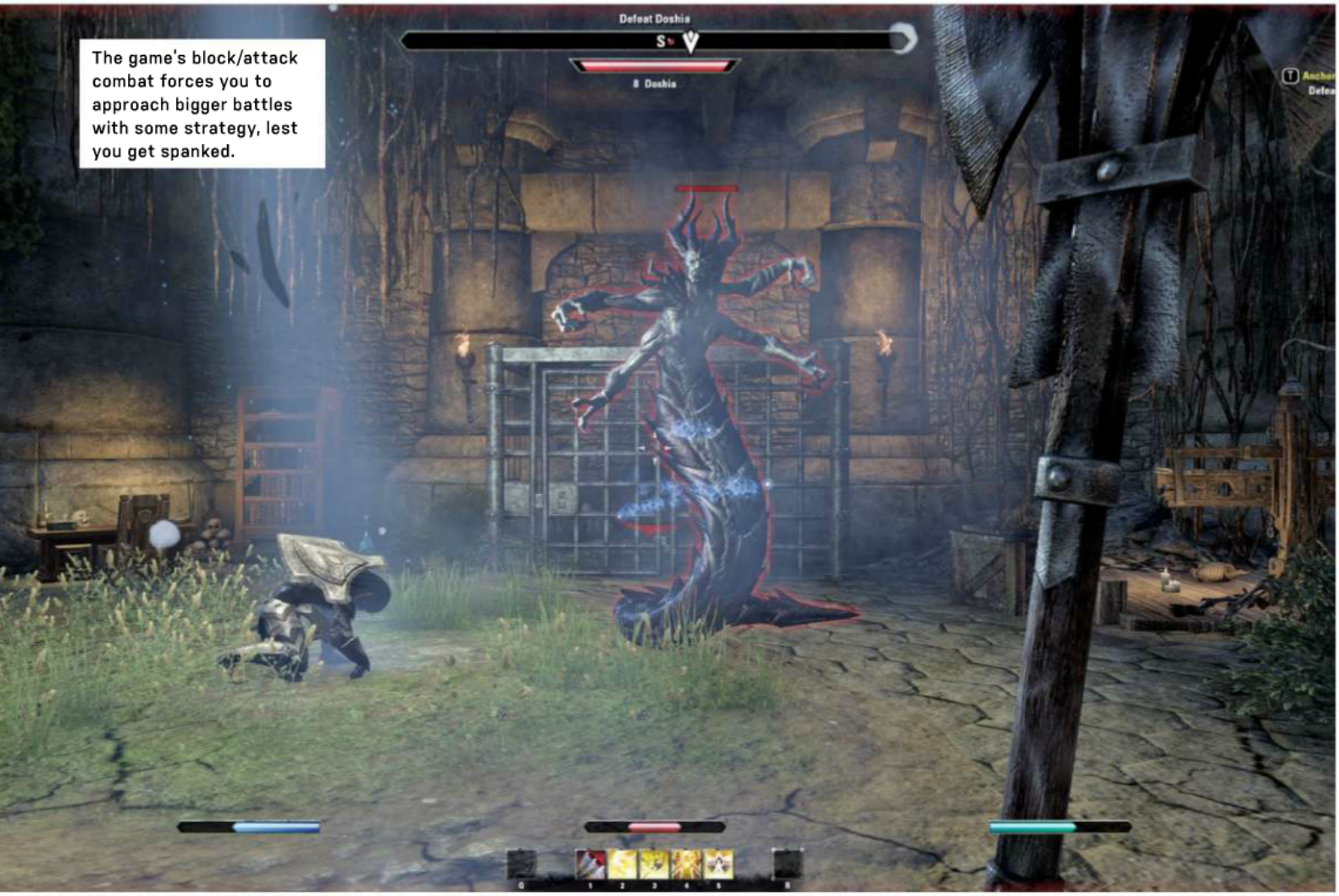
VERDICT **6**

Watch_Dogs

DADE MURPHY Faithful graphical recreation of Chicago; intriguing hacking concept; great multiplayer components (if they work); far too much to do.

RICHARD GILL Noticeable graphical stuttering on some systems; Uplay might not work for you; combat and hacking feel at odds and unfocused; gameplay starts to feel too stale, too soon.

$60, http://watchdogs.ubi.com, ESRB: M



The game's block/attack combat forces you to approach bigger battles with some strategy, lest you get spanked.

The Elder Scrolls Online

We'd rather play *Skyrim*

REVIEWING A MASSIVELY multiplayer online game is a bit like trying to hit a moving target. By the time you read the words on this page, it's possible that dramatic changes will have hit the subject of our critique, *The Elder Scrolls Online* by ZeniMax Online Studios.

Perhaps the game will finally have some of the features we'd otherwise expect in a title based around the *Elder Scrolls* universe—namely, the inclusion of the fan-favorite Thieves Guild and Dark Brotherhood. Perhaps the siege-themed PvP will actually work. Perhaps people will actually be playing the game. Perhaps ZeniMax will have dropped the $15 monthly subscription fee in favor of a free-to-play, microtransaction model. Perhaps it will have even fixed the issue whereby players are forced to sign up for a subscription (and enjoy a $15 pre-authorization on their payment method) in order to use the 30 days of free game time that came with their retail purchase.

Our initial experiences stomping around the gorgeous, massively multiplayer world of Tamriel were a little disappointing. We've sunk countless hours into everything from *Skyrim* to *Oblivion* (much as it pained us) to *Daggerfall* (old-school). While we appreciate ZeniMax's attempt at transforming the typically epic *Elder Scrolls* games into a massively multiplayer melee, we can't help but think that we'd probably have more fun hitting up the mod community and extending our existing *Skyrim* experience for many hours' (if not years) worth of gameplay. It's free, there's a ton more to do, and we could simulate the effects of an MMO by chatting with our friends on Steam while adventuring.

That's not to say that *Elder Scrolls Online* isn't enjoyable in a few areas. The game does an excellent job with the main story line. You've been enslaved by Daedric prince Molag Bal (not a good thing) and have to break out of prison in an extradimensional realm (with some help from a nameless Prophet). You do that (spoilers), and proceed to go through the rest of the game learning why Molag Bal is attempting to merge the alternate dimension of Oblivion and the mortal realm and, naturally, trying to stop him and his followers from doing so.

In fact, you can pretty much go about *Elder Scrolls Online* pretending that the "online" component doesn't actually exist—the game reads very much like *Skyrim* minus some obvious and somewhat disappointing modifications. For example, its minimalist user interface is a lovely homage to the typi-

ABOVE Traps, while a cute addition to *The Elder Scrolls Online*, are easily bypassed and/or skipped—a poor implementation.

ABOVE RIGHT Finding "Skyshards" in the game rewards you with more skill points to spend on your character.

cal *Elder Scrolls* look and feel. However, in an MMO where you can't fast-travel to every waypoint you find on the map, the omission of a mini-map within the game's UI is a poor choice. It's annoying to have to constantly load up the full map to figure out where you're going; we spent plenty of time following the minimalist quest markers on the top of the UI, only to find that we went the back way around a giant hill (or city) and had to find a different route to our objective.

The major cities you run through can feel a bit sparse to us—and small compared to, say, their *Skyrim* counterparts. They also lack the immersion we'd otherwise find in a game like *Skyrim*, even though there are obvious commonalities: guards walking around, NPCs discussing the news, and occasional messengers running up to you and telling you that there's a new quest you should really consider doing.

Given that the game has an *Oblivion*-like focus of "big external evil force trying to mess up your world," we were surprised that city life in *Elder Scrolls Online* seemed so... tame. More public quests to pull together players around localized events would have been a way to get some activity going; having cities constantly under the threat of invasion from Molag Bal's forces could have made them feel more lively and dynamic.

The game does shine when it comes to individual questing, however. Its phasing—the means by which one person can experience different elements within the existing world that others can't see unless they're on that part of a given quest—is absolutely seamless. However, it's still subject to the same conventions from which most MMOs tend to suffer. Namely, that it can feel a bit too easy when 10 other people are in the same "phase" of a quest as you and are obliterating everything in sight on the way to the shared end goal. That, and having a handful of people just standing around portions of your quest does take away from the uniqueness of one's single-player experience; worse, when others are running around with copies of the same "unique" NPCs that are already following you.

We absolutely love that ZeniMax has sunk so much time and effort into voicing huge portions of the game; the voice acting within *Elder Scrolls Online* is a delight, helping to give one's activities (be they boring or heroic) a more weighty, storytelling feel. The same can't be said for the game's general economy and rewards system. There aren't any auction houses whatsoever, which forces you to join player-created "trading guilds" in order to peddle your wares to a smaller subset of players. This also has the added effect of crapping up the game's general chat, with others trying to sell things.

As for the rewards system, we think it needs a bit of tweaking. For example, we wasted quite a bit of time (and lives, and soul gems to respawn ourselves) clearing out one of the game's "Dark Anchors"—hangout points for Molag Bal's forces—only to be rewarded with a paltry sum of 30 or so gold pieces. We were expecting something a bit more interesting for killing so many baddies and destroying a giant series of chains extending up into the sky; what we got was the equivalent of allowance for our school lunch.

ZeniMax's focus on more realistic MMO combat can make the game's normal encounters challenging even for MMO veterans; we love it, though we wish we had a chance to test our mettle against other players. We finally gave up on the game when we jumped into one of its major online battlegrounds, Cyrodiil, only to find that it was a complete ghost town. It's hard to siege a castle by yourself. Worse, a bug in the game's PvP training made it impossible for us (and others) to complete the quest, thus making it also impossible for us to earn any rewards for solo activity in the seemingly empty battleground.

While some of our quibbles will surely be patched up by the time you read this, *The Elder Scrolls Online* doesn't feel as if it came out of the gate with enough of a bang in the greater MMO universe. It's a title that might be worth investigating after it's had a bit more time to simmer (or after it goes free-to-play), but there are other MMOs (and single-player *Elder Scrolls* titles) worth your attention until then. –DAVID MURPHY

VERDICT **5**

The Elder Scrolls Online

DARK ANCHORS Gorgeous graphics; amazing soundtrack; lovely voicing of characters; strong recreation of *Elder Scrolls* look and feel; excellent phasing (when it works well).

OBLIVION GATES Crafting feels too complicated; economy feels off; bugs dampen experience; "do anything" skill system hurts effective grouping; game needs more overall interactivity.

$60, retail and digital; $15/monthly, http://elderscrollsonline.com, ESRB: M

LAB NOTES

TOM MCNAMARA **ASSOCIATE EDITOR**

Building Dreams

Observations on the assembly of a $30,000 computer

MOST OF THE TIME, our mission with the annual Dream Machine PC is to make an indisputable leap beyond last year's model. It's a challenge in itself, but things were made much easier by the introduction of Red Harbinger's Cross desk, the cavernous innards of which promised enough space for two high-performance computers.

Still, I forgot to hook up the Titan Z water cooling correctly because I'm a pinhead, and they idled at about 68 degrees Celsius—way out of spec. I switched the connecting tube to the other side, but it was too late for another photo shoot. So the error of my ways is on permanent display. On the bright side, we brought the idle temp down a whopping 40C, and I was able to get a stable overclock of 4.8GHz on the Devil's Canyon CPU that powered that system. The chip even got close to the performance of a stock hex-core Sandy Bridge-E CPU.

Things were a bit rockier for the Ivy Bridge-E system with the Radeon cards. For example, Asus tested 45 of these CPUs, and only one of them was stable at 4.8GHz, and just 20 percent of the batch could handle 4.7GHz. We had to settle for 4.6GHz. That's just how it goes sometimes. It's still a ton of performance, albeit disappointing after hitting 5GHz with the Sandy Bridge-E chip in last year's Dream Machine; we ended up with roughly the same CPU performance. AMD's R9 295X2 also didn't overclock much, possibly due to its locked voltage. Ultimately, water cooling and voltage tweakability on the Titan Z GPUs allowed them to surpass the R9 295X2—but don't stare too long at the Titan Z's price tag, as the abyss may stare back into you.

As for the case, its drive-bay covers attach to the drive cage itself, so removing a bay created a hole that we had to cover with Kydex. More space underneath the motherboard trays also would have been welcome. It's still great overall, for a first-gen design. The Cross desk gave us the X-factor we needed to elevate the Dream Machine above our previous ambitions.

ALAINA YEE

Managing Editor

In all the fuss that came out of Google's I/O conference, the news that Android OS apps will run on Chrome OS is the most interesting. From an informal IT-support perspective, this means it could be possibly easier to manage my relatives' computing needs ("It's just like on your phone, grandpa—the program's exactly the same, you just use a keyboard to type instead"). On the other hand, it also means that the iron-clad, dead-stupid simplicity of Chrome OS could be more complicated due to being able to install any bit of malware. Still, it's very possible giving out more Chromebooks as gifts may be in my future.

JIMMY THANG

Online Managing Editor

I hate to keep bringing up Nvidia Battery Boost in my small corner of Lab Notes, but I can now say that I have strong evidence that suggests the battery-saving measure is largely a load of hogwash. This month, I received a 13.3-inch 3K gaming notebook from Eurocom running a GeForce GTX 860M. On it, I ran our *Metro: Last Light* benchmark ad nauseam, using both the 3K and 1080p settings multiple times, until it keeled over. I found that Battery Boost not only failed to outlast the default battery setting, but in some instances, it actually performed a handful of minutes worse. D'oh!

First Look: Roccat Sova

A wireless gaming board for the living room

WHILE THE FUTURE OF STEAM MACHINES is still up in the air, we are excited about gaming PCs making a push for the living room. With small form factor chassis becoming smaller than even consoles, this trend seems almost inevitable. It isn't a done deal, however, because playing PC games while sitting on the living room couch currently presents problems. Sure, the Xbox 360 controller can work in a pinch and is fine for action games and platformers, but what about strategy games or MOBAs? And, we'd choose keyboard and mouse over controller for shooters any day. We suppose you could set up a small TV tray in front of the sofa for your keyboard and mouse, but with all the wires dangling everywhere coupled with the cramped space, that just ends up as being a janky solution.

German peripheral manufacturer Roccat is attempting to address that issue with its modular wireless keyboard and mouse pad combo. Dubbed the Sova, the device is meant to rest on your lap. We had a chance to conduct a video interview with Roccat at E3 (you can view it here: http://bit.ly/MPC_sova) where a representative walked us through an early prototype of the unit. The wireless device will feature a 1,000Hz polling rate via a proprietary hub that Roccat is designing; the company asserts that it will be "lag-free." While Roccat doesn't plan on shipping the unit with a wireless mouse, you'll be able to use any mouse with it as it has two USB ports. This essentially means you'll be able to turn any wired mouse into a wireless one. Dangling USB cable, you say? Well, Roccat has thought about that, too. The Sova will have an integrated cable channel on the back which will allow you to tuck away any dangling cords. In addition, the second USB on the Sova will allow you to charge your phone or plug in a USB headset. While the build we saw is far from finished, expect to see a truncated mechanical keyboard (i.e., no numpad) with 74 backlit Cherry MX switches. When we asked Roccat which switch types the Sova would ship with, the company said it is still experimenting and are primarily looking at black, brown, and red switch types. If you're worried that the mouse pad might be a little too cramped right next to the keyboard, take comfort in knowing that you'll be able to slide out the mouse pad a few inches in, case you prefer a wider layout.

The build we saw was a bit big and heavy, but Roccat says the design is far from finished, adding that some heft is desirable—if the Sova is too light, it would be wobbly in laps. Fortunately, the Sova does have some soft padding underneath to provide airflow and comfort. Another gripe we may have with the device pertains to battery life. Roccat says the Sova should last somewhere between 8–12 hours which, pardon the pun, may not sit well with some gamers. Luckily, you won't have to resort to purchasing Costco-sized battery packs every week, as the unit will charge using micro-USB.

The device doesn't have a release date or price announced yet, and the company is still experimenting with the chassis design. As it stands right now, Roccat is most likely going to go with a brushed aluminum finish, but the company is also asking users to provide feedback, which you can leave here: http://bit.ly/MPC_roccat. Even though it's still in its early stages, we can't remember the last time we were this excited about a gaming peripheral. **—JT**

The Sova will work on Windows, Android, and SteamOS.

GEEK TESTED & APPROVED

Xbox One Controller

SOME GAMES just can't be played with a mouse and keyboard. For most PC gamers, the default's been a wired Xbox 360 controller—but now, with the release of Windows drivers for the Xbox One controller, we've got a new choice.

This "next-generation" peripheral offers a few noteable updates over its predecessor: a micro-USB port at the top, as well as improved thumbsticks and d-pad. We dig being able to buy whatever length micro-USB cable we want, and for far cheaper than any "official" one, too—especially since you can't currently use the controller wirelessly with a PC.

And with a more precise d-pad and thumbsticks that are far less stiff than their Xbox 360 counterparts, the Xbox One controller feels more responsive when paired with default controller settings. (Though how much more varies by game—in *Assassin's Creed IV*, the difference is very minor; in *Metro 2033*, it's quite noticeable). Sure, you can tweak said settings to your liking no matter what the controller, but it's nice that with the Xbox One controller you won't necessarily have to.

The other updates—its slightly changed look and its revamped shoulder buttons—aren't as great. Some of us found the XB1 controller less comfortable to use during long gaming sessions, and the shoulder buttons don't always register long presses. Still, for its smoother performance, it gets our geek seal of approval. **—AY**

$60, http://bit.ly/MPC_xb1c

LETTERS

WE TACKLE TOUGH READER QUESTIONS ON...

> Time for an Upgrade
> Solving a Mystery
> End-of-the-World Preparations

Well, Who Has the Haswell?

I always check out your Blueprint "Performance" and "Ultra" builds, and I see they're still based on older chips. Why haven't you moved on to Haswell? You ran a write-up in the August 2013 issue, "Here Comes Haswell," and gave it a great review. But almost a year later, you're still not recommending it. What gives?
—Steve Vanetti

ASSOCIATE EDITOR TOM MCNAMARA RESPONDS: Those two builds use Intel's LGA 2011 platform, which does not have a Haswell-generation CPU yet (though Haswell-E should be available by the time you read this). As this issue went to press, Ivy Bridge-E was the newest generation at that tier. Our "Baseline" system uses an LGA 1150 motherboard, which takes the Haswell chips that have been out for about a year.

Are Chromeboxes Five by Five?

You do a great job of reviewing these Chromeboxes, but I am still very confused what they run! Will they run x86 programs? Web browsing only? No one seems to talk about the software they will run. I am interested in using them for my Ham Radio station running the digital modes. Will it run software like JT-65, PSK, RTTY, etc.? The Best Buy "geeks" have no idea, but unfortunately, that's all we have here for computer stores and I've got no one else to ask. Can you give an in-depth overview on what these actually run in the real world, and not just their hardware and specs? **—Gary**

EDITOR-IN-CHIEF GORDON MAH UNG RESPONDS: Sorry, Gary, Chromebooks and Chromeboxes out of the box are strictly made to run Google's Chrome OS. That OS is basically a very lightweight Linux build that supports the Chrome browser. Period. There is a way to jury-rig another OS into Chromebooks and Chromeboxes, but that's not what they're intended for. If you're looking for a reasonably powerful box that's the same size as the Asus Chromebox but is intended as a more traditional experience, you should look at Gigabyte's Brix series and Intel's NUC series. Both have affordable versions that offer plenty of x86 performance and will take to a standard Linux or Windows install without bending your brain to make it work.

Breaking the Trend

In the July 2014 Antivirus Battle Royale article, you compare ten AV products, but there are 11 logos on the accompanying umbrella picture. The extra logo is for Trend Micro, which is not included in the comparison, or even mentioned in the article. As Trend is (or at least was) always one of the top-tier AV providers, I'm curious as to why they were not included in the "battle." **—Joel Breth**

EDITOR-IN-CHIEF GORDON MAH UNG RESPONDS: We originally expected to include Trend Micro and thus had the art created with Trend Micro included. As the story progressed, though, we realized we didn't have space and Trend Micro was not included. Unfortunately, no one remembered to remove the logo. We do have a stand-alone review of Trend Micro planned, though, so stay tuned.

Hot Swap, Cold Shoulder

On the 2013 Dream Machine, I really liked the Obsidian 900D, so I got one. But I've been perplexed about how to add the SSDs to the hot-swap cage. I can't really figure out an adapter to secure them to the hot swap 3.5-inch pull-out bay. I've tried three different 3.5-inch to 2.5-inch adapters...I'm sure you didn't just connect them and let them hang there, so what's your secret?
—Dan Leadbetter

ASSOCIATE EDITOR TOM MCNAMARA RESPONDS: Each drive cage comes with three plastic trays that slide out. The underside of each tray has screw holes that you can use to directly mount the SSD onto the tray. When installed onto the tray, the SSD will align with the hot-swap connector in the back of the cage.

PCs in the EOTWAWKI

If you were planning to keep your current PC setup(s) operating for the next 50 years, with the probability that a solar flare or other cataclysm may wipe out electric power, computer networks, and life as we know

CUT, COPY, PASTE

* In our July 2014 issue, we stated that restoring deleted files through the "Previous Versions" feature was available in Windows 8 and Windows 8.1. While there is a recovery option that functions the same as Windows 7's Previous Versions feature, it's called "File History" in Windows 8 and 8.1.

↘ submit your questions to: comments@maximumpc.com

it (no more Intel or AMD!), what would you be stocking up on? I am really very curious about this topic!
—Arnold Warren

EDITOR-IN-CHIEF GORDON MAH UNG RESPONDS: Nothing like the old EOTWAWKI (End Of The World As We Know It) scenario. Besides living far, far away from any urban areas, having a self-sustaining crops, a solar and wind grid, livestock, medical supplies, and the usual ten pallets of OD ammo cans of, well, ammo, you'd probably want a lot of duplicate hardware (entire systems of the same hardware) and software on media that you hope will last that long. That includes the operating systems, applications, games, databases, and probably everything you can suck down from the Internet and store. How long will a hard drive last? I've seen systems from the 1980s still in operation and I've seen drives that have been on my shelf for two years go bad, so you should plan for multiple backups on properly stored magnetic media (shielded from humidity, moisture, and temperature extremes) as well as copies on SSDs, too. Since they can't demagnetize over time, you would think an SSD would be more shelf-stable, but we don't know how that works in reality. Remember that optical media also doesn't last that long, either, and there have been reports of "archival-grade" discs faring no worse than optical media. You may also want to think about having an operating system that does not require access to the Internet to activate, as there will be no Internet when the CHUDs attack.

> IN THE JUNE ISSUE, YOU SHOWED A CREAM-COLORED CORSAIR 350D CASE. WHERE ON EARTH IS THIS CASE SOLD? I CAN ONLY FIND IT IN BLACK.

I Want That Beige PC!

In the June issue, you showed a cream-colored Corsair 350D case. Where on Earth is this case sold? I can only find it in black.
—Joe Iodato

EDITOR-IN-CHIEF GORDON MAH UNG RESPONDS: That system is not available for sale. We took a stock Corsair 350D and sent it to case painter Jim Sailing (http://bit.ly/MPC_smooth) and had it shot with a beautiful, vintage, Packard Bell beige. You should visit his website to view some of his work—it's palm-bitingly gorgeous and surprisingly affordable, too.

[NOW ONLINE]

NO BS PODCAST #226: IN-DEPTH INTERVIEW WITH AMD'S RICHARD HUDDY

If you can't get enough of us, you should check out our podcast, and if you've never listened to the podcast before, episode 226 is a great place to start. Listen along as we sit down and interview AMD graphics guru Richard Huddy. In our deep-dive discussion, Huddy asserts that Nvidia adds lines of code into Nvidia Gameworks titles that hinder performance of AMD graphics cards. In addition, we talk about Mantle vs. DirectX, AMD's answer to Nvidia G-Sync, the future of 4K, and much more.
http://bit.ly/MPC_amd

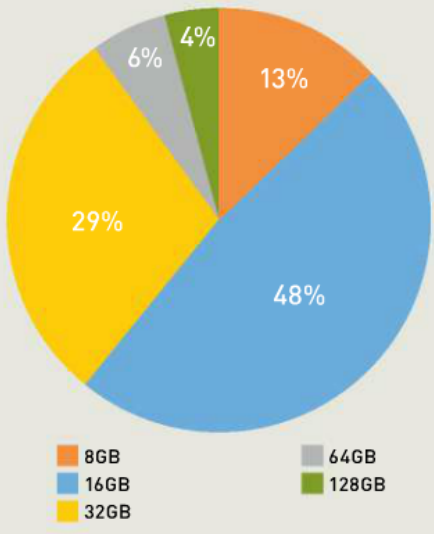
Facebook Polls

What Do You Think Will Be in This Year's Dream Machine?

While guts-deep in our Dream Machine build this year, we thought we'd test the predictive abilities of our readers on Facebook. (We think we'll still be able to keep surprising you in the future.) Here are some of our favorite responses.

John Alvino: 455ci big block, lopey cam, headers, notched pistons.... Wait, I thought this said Maximum HP.
Spencer LeFevre: Dual liquid-cooled flux capacitors.
Manuel Quiroz: A couple of R9 295x2s with a water block from EKG or the like. RAID 0 SSDs and RAID 1 HDDs. The case—maybe the huge one with wheels and looks like a fridge. Bunch of RAM and hopefully a 4960X with a mega OC. And a nice mobo.
Tyler Emmerich: Empty wallets.
Masoud Zarshenas: Dat Lian Li desk.
Bob Creamer: Beer cooler and a microwave.
Jake Kerz: Dream Machine 2010 still holds the crown for raw 24-thread power in a multitasking environment. You need to finally beat that. Also go dual-GPU cards to make room for PCIe SSDs.
Ron Thomas: AMD K6-2 400 MHz. PERIOD.
Joel Funaki Gonzalez: The hopes and dreams of several small orphanages.
Dave Hackett: Do it in a truly custom case out of carbon fiber.
Bryan Hoffmaster: 12GBs SAS backplane with a RAID 0 setup on some enterprise SSDs.
Scott Hewitt: Liquid nitrogen on Devil's Canyon.

How Much RAM Will Your Next Build Have?



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THE BUILDS

BUDGET

INGREDIENTS

PART		PRICE
Case	NZXT Source 210 Elite	$50
PSU	Corsair CX500 500W	$30
Mobo	Biostar TA970	$60
CPU	AMD FX-6300	$120
Cooler	Cooler Master Hyper 212 Evo	$36
GPU	Sapphire Radeon R7 265	$163
RAM	2x 4GB G.SKILL Ares Series DDR3/1600	$72
SSD	120GB Samsung 840 EVO	$81
HDD	1TB Seagate Barracuda	$65
OS	Windows 8.1 64-bit OEM	$100

Approximate Price: $777

FOR THE FIRST TIME IN A WHILE, we have reached equilibrium at the budget level. Each part on this list is pretty much the best bang for your buck. You could spend a little less on the solid-state drive, but we still prefer the software package that comes with this Samsung 840 Evo. You could put a closed-loop liquid cooler (CLC) in here, but the Cooler Master Hyper 212 EVO is too good a value to pass up at this tier. Might as well put the extra cost of a CLC toward something else. If you're prepared to spend about $800, we'd bump the SSD up to a 256GB Crucial MX100, which currently goes for $110. That'll give gamers a lot more room to install their favorite games on a zippy storage device.

BASELINE

INGREDIENTS

PART			PRICE
Case	Corsair Vengeance C70		$108
PSU	Silverstone Strider Plus 850W	NEW	$100
Mobo	Gigabyte G1.Sniper Z87		$175
CPU	Intel Core i5-4690K	NEW	$240
Cooler	Cooler Master Hyper 212 Evo		$35
GPU	XFX Radeon R9 280X	NEW	$250
RAM	2x 4GB G.SKILL Ares Series DDR3/1600		$72
Optical Drive	Samsung SH-224DB/BEBE		$20
SSD	Crucial MX100 256GB	NEW	$110
HDD	1TB Seagate Barracuda		$65
OS	Windows 8.1 64-bit OEM		$100

Approximate Price: $1,275

THE STRIDER PLUS, a fully modular 850-watt power supply from Silverstone, is reasonably priced, so it replaces the 750-watt semi-modular Seasonic unit we slotted last month. The extra juice better prepares this system for multiple video cards down the road. Intel's Devil's Canyon Core i5-4690K arrives, replacing the i5-4670K. The new one's base clock speed is 4Ghz, which is 600MHz higher than before, and it will turbo to 4.4GHz. Radeon cards continue to fall in price, and the R9 280X is now within reach; it's now a better value at this tier than a GeForce GTX 760. But the 250GB Samsung 840 Evo at $160 is no longer competitively priced, so we've replaced it with the 256GB Crucial MX100, which isn't as fast but is a much better value.

PERFORMANCE

THIS BUILD PREVIOUSLY FEATURED a quad-core Ivy Bridge-E (IVB-E) CPU on the LGA 2011 platform, aka X79. With the zippy Devil's Canyon CPUs available, we've switched to Intel's Core i7-4790K. It's a refresh of the company's newer "Haswell" generation on the less expensive LGA 1150 platform. Since LGA 1150 is limited to 16 PCI Express lanes, whereas X79 has 40, the new mobo and CPU don't handle three or more video cards nearly as well. But if you stick to "only" two video cards, you'd need a benchmark to see the difference between the two platforms. Like the i5-4690K, this chip starts at 4GHz and boosts to 4.4GHz. (We also don't want to recommend an X79 system, since it will be retired within the next few months, in favor of the incompatible LGA 2011-3, aka X99.)

We're also sticking with the GA-Z97X-UD5H motherboard at this higher tier, because its mixture of price, performance, and features is hard to beat. We could get a less expensive SSD, but money isn't as strong of a concern at this tier.

For more of our component recommendations, visit www.maximumpc.com/best-of-the-best.

INGREDIENTS

PART			PRICE
Case	NZXT Phantom 530		$130
PSU	XFX P1-1050-BEFX 1050W	NEW	$180
Mobo	Gigabyte GA-Z97X-UD5H	NEW	$175
CPU	Intel Core i7-4790K	NEW	$340
Cooler	Corsair H100i		$100
GPU	EVGA GeForce GTX 780 03G-P4-3784-KR		$550
RAM	4x 4GB G.SKILL Ripjaws F3-12800CL9Q 16GBRL		$150
Optical Drive	LG WH16NS40 Blu-ray Burner		$70
SSD	500GB Samsung 840 EVO		$250
HDD	3TB Seagate Barracuda		$110
OS	Windows 8.1 64-bit OEM		$100

Approximate Price: $2,155

UPGRADE OF THE MONTH
INTEL CORE I7-4790K

With a new wave of game development often geared for consoles using more than four processing threads, it's not a bad idea to take the leap to Intel's Core i7 chips (or AMD's FX-8350), since they have eight threads. The i7-4790K is our weapon of choice, coming in at 4GHz.
$340, www.intel.com

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